Please refer to this report as:

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About this report

In November 1986, the Pacific Gas and Electric Company Deep Crustal Geophysical Survey acquired seismic reflection data offshore from the San Luis Obispo, California area. Rice University and Houston Advanced Research Center (HARC) participated in the survey (Meltzer and Levander, 1991), also known as the RICE/HARC/EDGE California Margin Reflection Survey. Line RU-3 was part of the survey.

Reference

Meltzer, A. S. and Levander, A. R., 1991, Deep crustal reflection profiling offshore southern central California, Journal of Geophysical Research, vol. 96, no. B4, pages 6475-6491.

PROCESSING REPORT:

SEISMIC LINE RU-3

RICE/HARC/EDGE

California Margin Reflection Survey

Submitted by Kirk McIntosh
University of California
Santa Cruz, California
August 12, 1987

INTRODUCTION

This report describes the processing, testing and current status of seismic line RU-3, as well as some suggestions for further work not possible at this time. Acquired in November 1986, RU-3 was part of the RICE/HARC/EDGE California Margin Reflection Survey offshore from the San Luis Obispo, California area. The data acquired in this survey were dip lines RU-3 and RU-13 and strike lines RU-2, RU-5 and RU-10. RU-3 extends from approximately 9 km off the coast to a point past the base of the continental slope, a distance of 117 km (Figure 1).

The purpose of the survey was to examine the crustal structure of the central California margin. A more specific goal was to identify the extent that the major faults and terrain boundaries of this area are related to normal, transform, or thrust faulting.

The processing objectives were to produce sections that enhanced reflections at mid and lower crustal depths as well as to produce higher resolution sections to study the sedimentary section. Time migrations were produced from both these versions.

RU-3 was processed with the facilities of the Rice University Department of Geology and Geophysics. The hardware included an ELXSI 6400 super-minicomputer, Numerix Mars 432 array processor, four Telex model 6253 tape drives, 2.1 giga-bytes of disk storage and a Versatec, 24 inch plotter. The software used for the data processing was Digicon's DISCO, version 7.1.

ACQUISITION

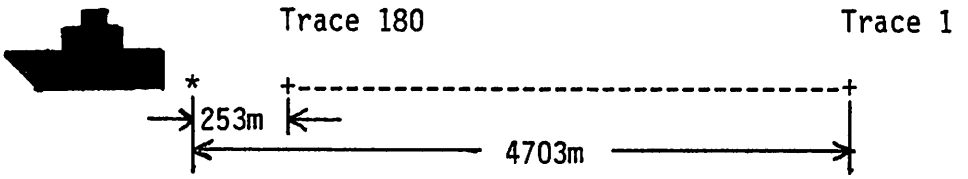
The data acquired in the RICE/HARC/EDGE California Margin Reflection Survey totaled approximately 438 km. Of that, RU-3 was approximately 117 km long. Digicon, Inc., performed the work in November 1986, with their vessel the Atlantic Seal. As the purpose of the survey was to study crustal scale structures, the energy source was a massive 6000 cu. in. airgun array, the far offset trace was 4703 m from the source, and the record length was 16 seconds. Other acquisition parameters, including the spread configuration, are shown below in Table 1.

The line was shot in four separate, overlapping pieces; RU-3 was recorded with the vessel moving toward the coast and RU-3A, RU-3C and RU-3D were recorded with the vessel moving away from the coast. Figure 2 summarizes the line geometry as recorded and also as it was altered and input to the DISCO module SOURCE.

TABLE 1. ACQUISITION PARAMETERS

Navigation System	SYLEDIS
Recording Instruments	DSS-240
Tape Format	SEGY
Sample Interval	4 ms
Recording Filters	Lowcut 3 Hz at 6db/Oct. Highcut 80 Hz at 72db/Oct
Record Length	16 seconds
Number of traces	180
Source	Airgun
Depth	25m
Volume	6000 cu. in.
Pressure	1900 PSI
Interval	50m
Receiver Interval	25m
Near Trace Offset	253m
Far Trace Offset	4703m

Spread Configuration:



PROCESSING

Alan Levander and Anne Meltzer performed the initial processing steps which are listed below:

1) Displayed Shot Gathers
Displayed every 50th shot for quality control (trace editing) purposes.

2) Near Trace Gather
Made near trace gather for initial examination of the line and for later use in selecting points for mute and deconvolution application, both of which are dependent on water bottom depth.

3) Edited Noisy Traces

4) Defined Geometry
Because the line was shot in sections and also in opposing directions, the shots were renumbered for the geometry definition step. This resulted in a line with shot numbers increasing from southwest to northeast. Table 2 below shows the relationship between shotpoint numbers, field file numbers (F.F.I.D.), shot numbers (renumbered) and input reels.

TABLE 2.

SECTION	SHOTPOINT	FIELD FILE I.D.	RENUMBERED SHOT	REEL
RU-3	239	581	2423	0021RB (TAPIN REEL)
	1819	05	1847	0014RA (TAPIN REEL)
RU-3A	1911	100	1846	0022
	1269	733	1213	0029
RU-3C	1268	104	1212	0017
	967	405	911	0120
RU-3D	966	100	910	0122
	52	1010	1	0134

a) Shotpoint number represents a numbered, geographical location.
b) Field File I.D. is a sequential count of shots as they were recorded.
c) Shots were renumbered for input to the SOURCE module to give shot numbers that increase from southwest to northeast along the entire composite line.

5) Summed Adjacent Traces in Shot Gathers
Adjacent traces in shot gathers were summed using the MITRE module of DISCO. The objective was to increase signal to noise ratio and particularly to reduce data volume. This resulted in an effective receiver interval of 50m and 90 traces per shot instead of the original 180 traces per shot.

6) Sorted to CDP gathers
Two different jobs were used to sort RU-3 to CDP gathers from shot gathers. One job was used to sort section RU-3 and the other sorted RU-3 A, C and D to CDP gathers.

At this point I resumed the processing of RU-3. The significant steps that I performed are listed and described below:

1) Selected Locations for Mute and Deconvolution Parameter Definition
The waterbottom along RU-3 varies from 5.2 seconds at the base of the continental slope to 0.1 seconds at the landward end of the line. Points where mute patterns and deconvolution design windows were defined were selected by using the near trace gather. These points of definition were selected on the basis of waterbottom bathymetry to allow linear interpolation from point to point.

2) Extracted and Displayed CDP Gathers
Eleven adjacent CDP gathers every 120 CDP were extracted from the CDP sorted tapes of RU-3. The extracted gathers were output to tape and the center gather of each set was displayed. The gathers on tape were used repeatedly for subsequent testing and allowed the use of four tapes instead of twenty-four. Mute patterns and deconvolution design windows were selected using the displayed gathers.

3) Pre-NMO Mute Design

The pre-NMO mutes were designed chiefly to aid in velocity analysis. The objective was to retain as much of the waterbottom reflection as possible while eliminating direct arrivals and refractions on the far traces. Representative mute patterns are shown in Figure 3.

4) Deconvolution

The deconvolution parameters used for most versions of RU-3 were selected mainly with the objective of enhancing deep reflectors. Although it sacrificed wavelet compression in the shallow section, a thirty-two millisecond gap was selected to prevent high frequency noise from being introduced deep in the section . The 200 ms operator length was selected to attenuate bubble pulse energy and short period multiples. Design window length of two seconds was justified by the fact that most of the well bedded sedimentary section occurs in the upper two seconds of data and also the rule of thumb specifying window length at approximately ten times the operator length. On CDP gathers where design windows were defined, three consecutive two second windows were selected. Individual windows were designed to accommodate the moveout of reflection events by specifying start and end times at both the near and far offsets (Figure 4). The start times of the upper-most window were consistently picked 100 ms below the water bottom reflection. This decision was based on the fact that, along much of the line, noise from direct arrivals was sufficiently close to the waterbottom reflection as to degrade any benefit gained by including the waterbottom in the design window. Only one departure was made from the parameters stated above; in the STRATSTAK version of RU-3 a four millisecond gap was used. The objective here was to increase temporal resolution by means of wavelet compression. Due to the excellent bandwidth in the shallow part of the section, resolution of the sedimentary section was improved considerably without introducing a significant amount of noise.

5) Preliminary Velocity Analysis

This stage of processing was performed by using the VSTUDY and VDSPLY modules of DISCO. The data was prepared for velocity analysis by applying mute and deconvolution as described above and two adjacent CDP gathers were used for each analysis. The display which results from these modules is contoured coherency on a graph of time versus velocity. In general, the specified ranges were 0-10 seconds and 1400-7000 meters per second. VSTUDY analyses were performed every 240 CDP (3 km). As seen in Figure 5, from CDP 9050 in the Santa Maria basin, these displays give very good results in some areas although picks become quite ambiguous at depth. Other areas such as the Santa Lucia Bank were not nearly so conducive to accurate velocity selection as seen in Figure 6.

6) Post-NMO Gather Display and Mute Selection

The final step before performing the preliminary stack was to display NMO-corrected CDP gathers (one per 1.5 km) for quality control and to pick the post-NMO mute patterns. The mute was designed to eliminate data with excessive NMO-stretch (Figure 7). In some areas shallow, high-amplitude, multiple reflections dominating the far traces were also removed. An attempt was made to retain a fairly standard shape for the mute pattern with most of the changes necessitated by the variable water depth along the line.

7) Preliminary Stack

Following velocity analysis and post-NMO mute design, a preliminary stack was performed. The processes used for this job are listed in order below:

TAPIN	- tape input
SPKCHK	- spike editing
MUTE	- pre-NMO mute
AGC	- 500 ms AGC
DECONA	- predictive deconvolution
BALANCE	- trace amplitude equalization
NMO	- normal moveout correction
MUTE	- Post-NMO mute
STACK	- nominal 45 fold stack with normalization
DSKWRT	- write stacked traces to disk
AGC	- 1000 ms AGC
FILTER	- 5-60 HZ bandpass filter
SECPLOT	- section plotting program

SPKCHK was included to edit a spike encountered in CDP 2714 and any other spikes that may have been present in the data. BALANCE was applied using one window per trace (4 to 6 seconds long) in order to equalize trace amplitudes following deconvolution. The normalization option was used in STACK to compensate for differences in fold due to muting. The bandpass filter was applied with a 12 dB/octave slope on the lowcut and a 24dB/octave slope on the highcut. Other processes used need no explanation or have been previously discussed.

8) Second Pass Velocity Analysis

A second round of normal moveout correction velocity analysis was performed following the preliminary stack. This time the VELEX module of DISCO was used and the interval between analyses was reduced 50 percent to 1.5 km. The purpose of this work was to improve the accuracy of normal moveout correction by more frequent sampling and application and to concentrate on parts of the section of particular interest such as deep reflections and the Hosgri Fault Zone.

The VELEX displays (Figure 8) offered several advantages over the VSTUDY coherency plots. The fact that gathers as well as stacked traces are displayed allowed discrimination of desirable primary reflections from multiples in many cases, and steeply dipping noise that often stacked at high velocities was identified and avoided where possible. VELEX displays also yielded velocity information in structurally complex areas where VSTUDY results were unusable.

A concentrated effort to use VELEX displays to enhance the deep reflections was only marginally successful; due to noise and multiple reflections, it was extremely difficult to accurately identify the best NMO correction by looking at gathers and stacked traces. Frequently the deep reflectors appeared to stack equally well over wide ranges of velocities. Another problem encountered was that steeply dipping coherent noise sometimes dominated the stacked traces thereby obscuring any velocity information.

To supplement the VELEX displays, constant velocity stacks were made in six sections along the line: CDP 2240-2720, CDP 2800-3526, CDP 4000-4624, CDP 4624-5300, CDP 7600-8250, CDP 9000-9554. The constant velocity stacks further confirmed the velocity insensitivity of the deep reflectors although some deep reflectors were noticeably enhanced by applying velocities derived from these plots. A second benefit derived from the constant velocity stacks was that their results generally confirmed the velocity picks derived from VELEX displays. The results of the second pass velocity analysis (with subsequent minor changes) were stored in the file called DEFINAL.

9) Post NMO Gather Display and Mute Design

This step was essentially a repeat of step 6. For quality control, the gathers were displayed every 1.5 km following NMO application (one blatantly erroneousness water bottom velocity was identified). New post-NMO mutes were also selected to take advantage of the improved stacking velocities. The objectives here were once again to eliminate excessive NMO-stretch and to remove some multiple events from far traces shallow in the section.

10) Intermediate Stack

The processes used for the intermediate stack were identical to those used for the preliminary stack. Application of new stacking velocities, new post-NMO mutes, and using full sixteen second records were the only parameter changes. The resulting section showed definite improvement in the sedimentary section and obvious improvement was achieved in some deep reflections. The part of the section below ten seconds was disappointing; there was only an extremely vague suggestion of a dipping event which may be the continuation of an event visible above ten seconds.

11) Multiple Attenuation Processing

Multiples were evident along much of the preliminary and intermediate stacks and were predominant in some areas (i.e. the Santa Lucia Bank area). They caused problems in preliminary migration tests because they were inevitably over-migrated and produced multitudes of "smiles" that obscured primary events. The technique used for multiple attenuation was a standard procedure that involved four principal steps. First, a velocity function intermediate between the stacking velocities of the primary and multiple events was selected and applied to the CDP gathers. This left the primary events above the horizontal, or over-corrected, while the multiple events were stillunder-corrected and below the horizontal. The next step was to apply an FK filter that passed all dips above the horizontal and rejected the multiples which dipped below horizontal. This resulted in astonishingly clean gathers. The third step was to remove the NMO over-correction of the remaining events and proceed with processing. The fourth and final step was to mute one or more near traces where, regardless of velocity, all events are essentially flat. The near trace mute was applied along with the normal NMO-stretch mute immediately before stack. Figures 9 through 12 illustrate this process (the near trace mute is not shown).

The most obvious failure of the multiple attenuation process was that it failed to remove multiples of steeply dipping events below the waterbottom. The reason for this failure was simply that the steeply dipping multiples stacked at velocities in the same range as primaries at the same time. Consequently, with no velocity discrimination between primaries and multiples this technique is ineffective. The other main difficulty encountered was that multiples that were insufficiently corrected became spatially aliased and were thus unaffected by the FK filter. Two tools were employed to circumvent this inconvenience: the NMO-stretch mute removed aliased multiples shallow in the section and lower over-correction velocities prevented aliasing of multiples deeper in the section.

The advantages of the multiple attenuation processing far outweighed its shortcomings. The process was extremely effective on the waterbottom multiples (compare Figures 13 and 14). Futhermore, the process cleaned up the data immensely allowing a more effective deconvolution. The deep reflections were noticeably sharper and clearer following multiple attenuation.

12) Multiple Attenuation Stack

The processes used for the multiple attenuation stack were similar to previous stacks with the exception of the specific multiple attentuation processes described above. One result that occurred in areas of strong waterbottom multiples was that a "white" zone was left in place of the multiple. This problem can be avoided by employing AGC with a 100 ms gate following multiple attentuation processing. When tested however, it was obvious that the 100 ms AGC was detrimental to the rest of the section; the deep reflectors appeared subdued and

the sedimentary section of the Santa Maria Basin lost most of its amplitude contrast. Figure 14, in the Santa Lucia bank area, shows the advantage of the 100 ms AGC following multiple attenuation. The filmed versions of the multiple attenuation stack all had either 500 ms or 1000 ms AGC applied.

13) Migration

Numerous migration tests were performed, first using the intermediate stack and later using the multiple attenuation stack as input. In the intitial testing, migration velocities were applied only as necessary to accommodate obvious changes in the geologic section. Stacking velocities were used except when they were elevated due to dip. In most cases the results were quite good in the upper part of the section while over-migration was common at depth. As previously mentioned, another common problem in the early testing was the existence of multiples which tended to contaminate the section with "smiles." The second round of migration testing was performed using the multiple attenuation stack as the input and velocity functions adjusted according to the previous test results. Also, several additional velocity functions were added where necessary. The results of these tests showed improvement but with some over-migration at depth still a problem. The final migration velocities were still relatively close to the stacking velocities and in some cases unchanged. In the sedimentary section, deviation from the stacking velocities was within $\pm$15% and in the deeper part of the section, the velocities were reduced by approximately 0-20%.

14) Stratigraphic Stack (spiking deconvolution)

As indicated earlier in this report, the deconvolution parameters were selected primarily to enhance and not harm the deep reflectors. The objective of the stratigraphic stack, however, was to increase the temporal resolution of the sedimentary section. The excellent bandwidth and high signal to noise ratio in this part of the section allowed a successful application of spiking deconvolution (4 ms gap) without introducing excessive nosie. Deconvolution tests in Figures 15 through 28 show that significant improvement in resolution is obtained by using successively smaller gap lengths. It is also apparent that gap lengths below 16 ms involve a trade-off of diminished continuity for the increase in resolution.

There were only three differences between the stratigraphic stack and the previous multiple attenutation stack. The major change was to use a gap of 4 ms in the deconvolution application instead of the previously used 32 ms gap. Another change was the elimination of SPKCHK from the job. A first version of STRATSTAK was made that included SPKCHK; unfortunately the spike threshold level was too low in this version and many traces were either eliminated or heavily edited. The first version suffered from a reduced signed to noise ratio, a distorted wavelet shape, and a lack of amplitude contrast. The third departure of STRATSTAK from the MASTACK parameters was the use of 500 ms AGC gates instead of 1000 ms gates. Smaller AGC gates had

caused deterioration of deep reflections when they were tested on MASTACK, but the 500 ms gate used on STRATSTAK raised the amplitude of reflections in the areas where a strong waterbottom multiple had been removed without reducing overall amplitude contrast.

Suggestions for Further Work

One aspect that became clear while performing the various velocity analyses was that several parts of RU-3 could benefit from dip-moveout processing. The problem was particularly acute in the vicinity of the Hosgri Fault, one of the primary areas of interest. Here, very steep, high stacking-velocity reflections directly overlayed reflections with much lower stacking-velocities. The velocity function used was a compromise function that imperfectly stacked events of both dip over a range of several seconds. Dip-moveout might also be beneficial around the base of the continental slope.

Additional improvement might be made in RU-3 by doing velocity analysis using the gathers processed for multiple attenuation. As indicated earlier in this report, the gathers were "cleaned up" significantly by this processing and may lead to better defined stacking velocities in the mid to lower crustal part of the section.

Another processing step with probable room for improvement is migration. The results obtained so far are not bad but they are far from perfect. The problems encountered may be due to reflections from out of the plane of the section, to inherent problems of time migration in complex structures, or possibly to a velocity structure that is more complex and rapidly changing than anticipated. If complex velocity structure is the principal problem then significant improvement may be expected with additional testing and adjustments. Some areas worthy of further attention are listed below:

1) The continental slope and its base.
2) The shallow section northeast of the slope break where severely folded and faulted rocks have been imaged with only variable success.
3) The area where the two deep reflections (at approximately 6 seconds) are visible and apparently intersect. The dipping reflector here may well be related to a fracture zone that projects obliquely into RU-3. If so, at least some of the problems are due to the sub-optimum orientation of the structures.

SUMMARY

The major products obtained from the RU-3 processing work are listed below:

1) Preliminary Stack (VSTUDY velocities)
   - Jobfiles BRUTSTAK2 and BRUTSTAKH
2) Intermediate Stack (VELEX velocities, 16 second records)
   - Jobfile FULLSTAK
3) Multiple Attenuation Stack (Final Stack)
   - Jobfile MASTACK
4) Stratigraphic Stack (Multiple attenuation, spiking deconvolution)
   - Jobfile STRATSTAK

5) Time Migration of MASTACK
   - Jobfile MIGRATE
6) Time Migration of STRATSTAK
   - In two parts, Jobfiles STRATMIGA and STRATMIGB

The major processes that were used are listed below:

Mute
Deconvolution
Velocity Analysis
Normal Moveout Correction
Stack
Automatic Gain Control
FK Filter on CDP Gathers
FK Filter after stack
Time-variant bandpass filter
Migration
Display

- Velocity analysis was the most important and time consuming step in the processing sequence. Two full passes of analysis were performed with additional adjustments made when problems were identified.

- Multiple attenuation processing was well worth the effort expended. Following the exhaustive velocity analysis the over-correction velocity functions were relatively easy to pick. The process enhanced the deep reflections as well as the shallow reflections contaminated by strong waterbottom multiples.

- The spiking deconvolution stack of the multiple attenuation gathers resulted in an excellent display of the sedimentary section. Many intricate details of the stratigraphy were manifested with this processing.

- Migration of the two stacks has provided a relatively clear image of the geologic structure in time that should allow accurate interpretation of the major features.

LIST OF FIGURES

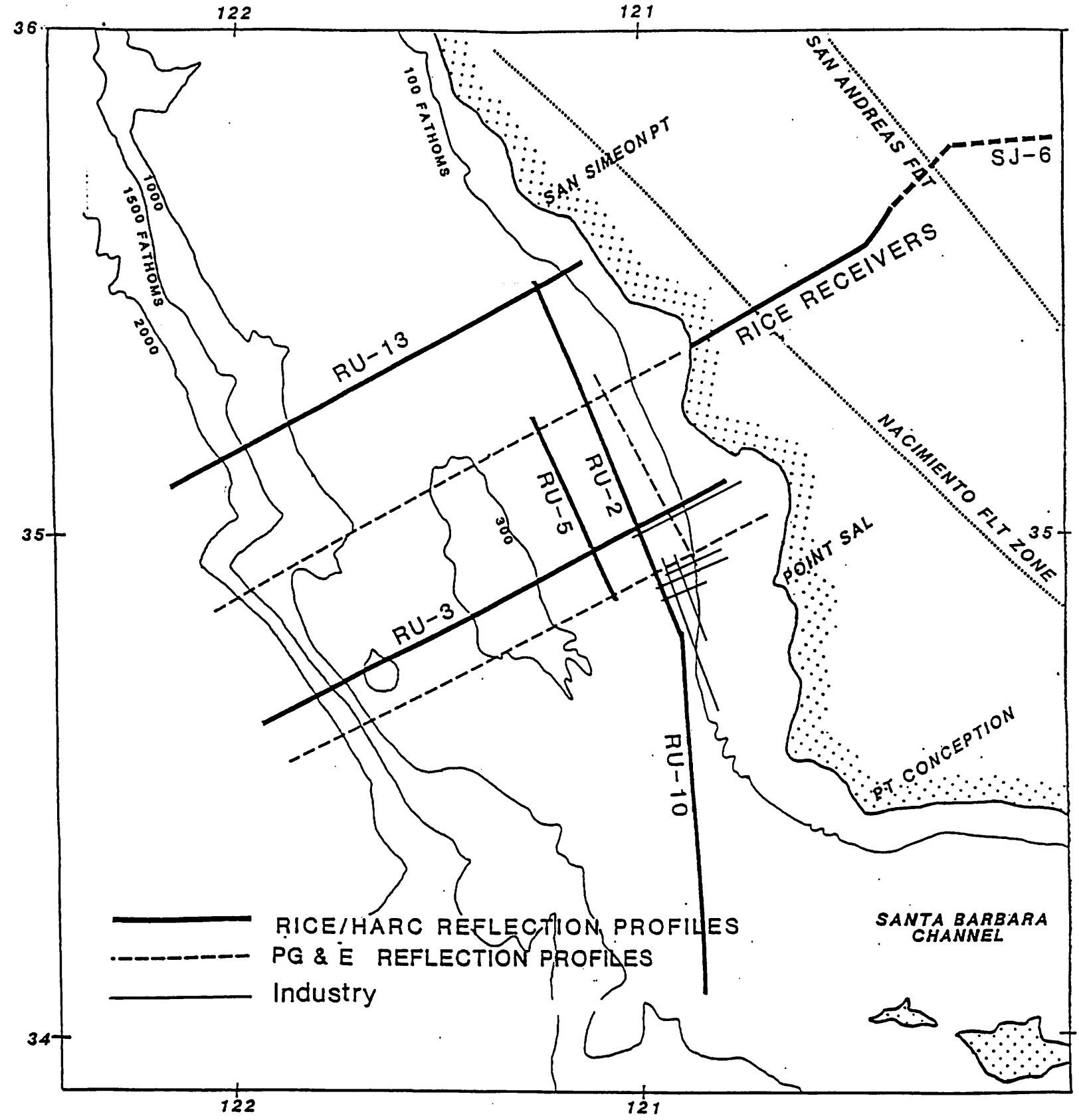
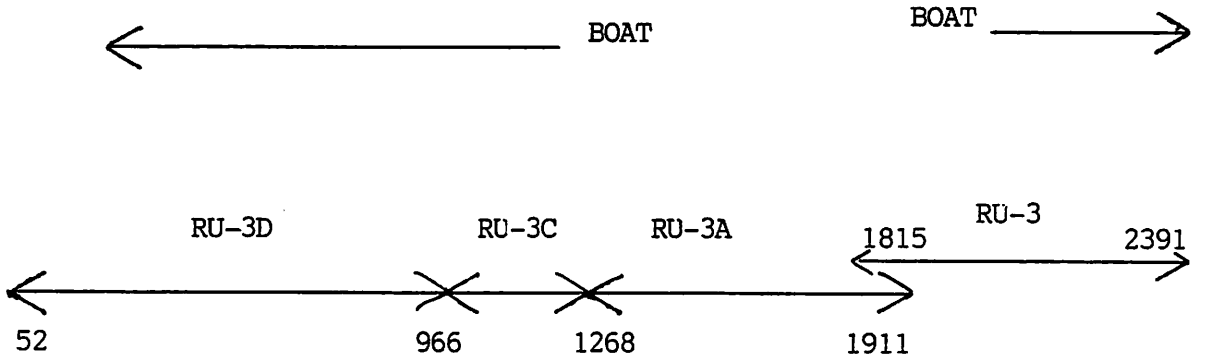
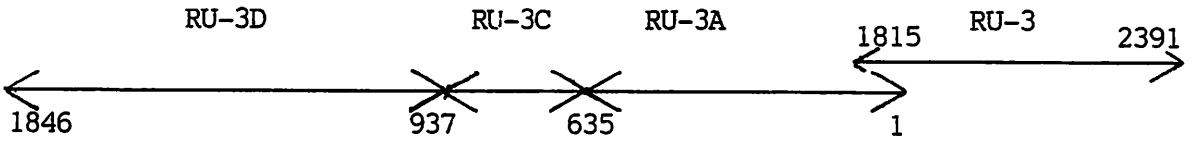

122
121
36
35
34
100 FATHOMS
1000
1500 FATHOMS
2000
SAN SIMEON PT
SAN ANDREAS FLT
SJ-6
RICE RECEIVERS
RU-13
RU-5
RU-2
RU-3
RU-10
300
NACIMIENTO FLT ZONE
POINT SAL
PT CONCEPTION
SANTA BARBARA CHANNEL
RICE/HARC REFLECTION PROFILES
PG & E REFLECTION PROFILES
Industry

FIG 1

SHOTPOINT NUMBERS (STATION NUMBERS)



SHOT NUMBERS WRITTEN BY CABLEIN



SHOT NUMBERS DEFINED IN SOURCE (RENUMBERED)

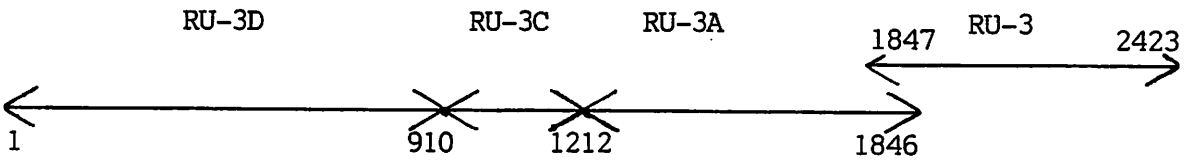


FIG 2

CDP GATHERS 3770 & 8570 WITH MUTE DISPLAYED

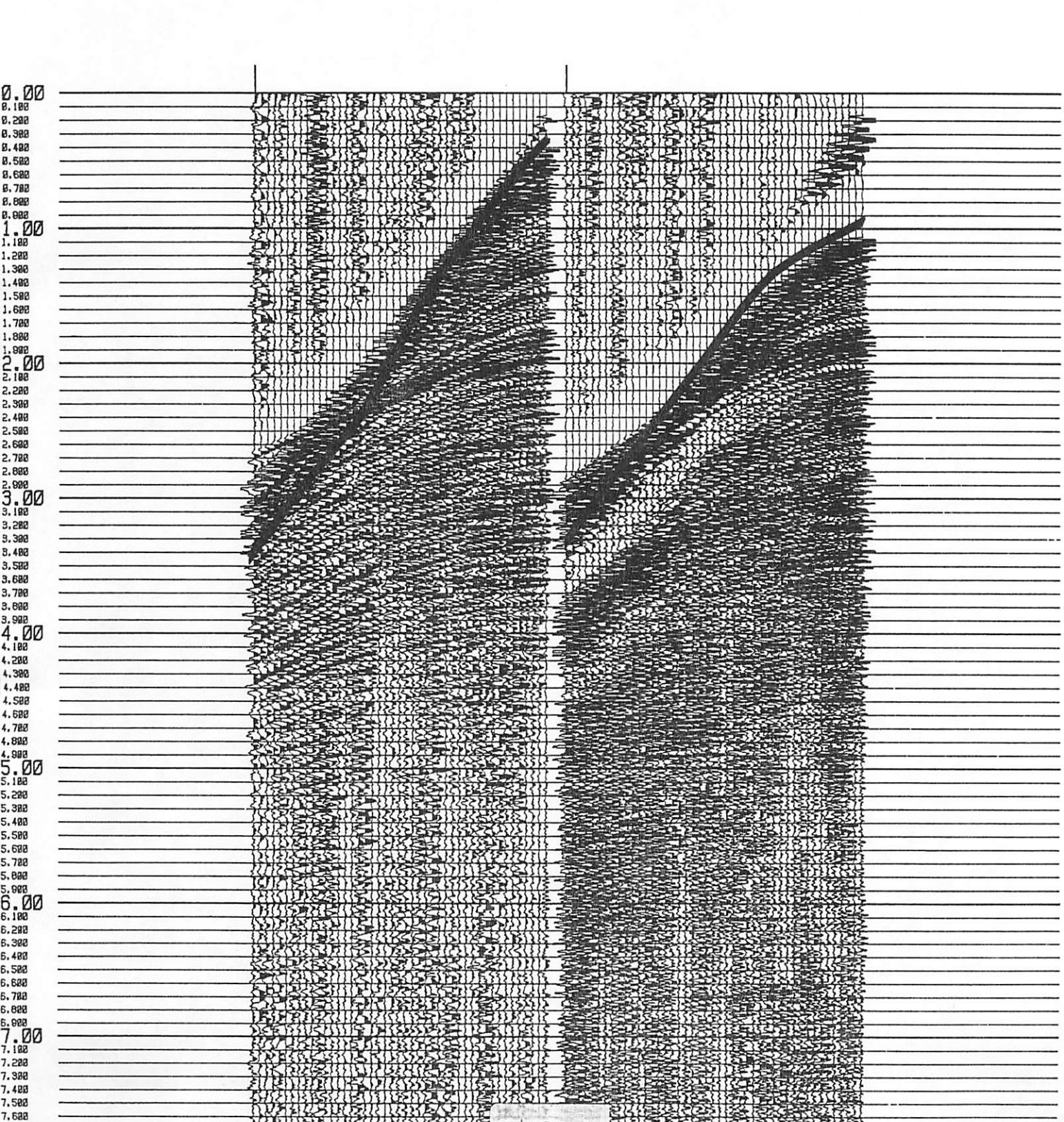


FIG 3

CDP GATHERS 3770 & 8570 WITH DESIGN WINDOWS

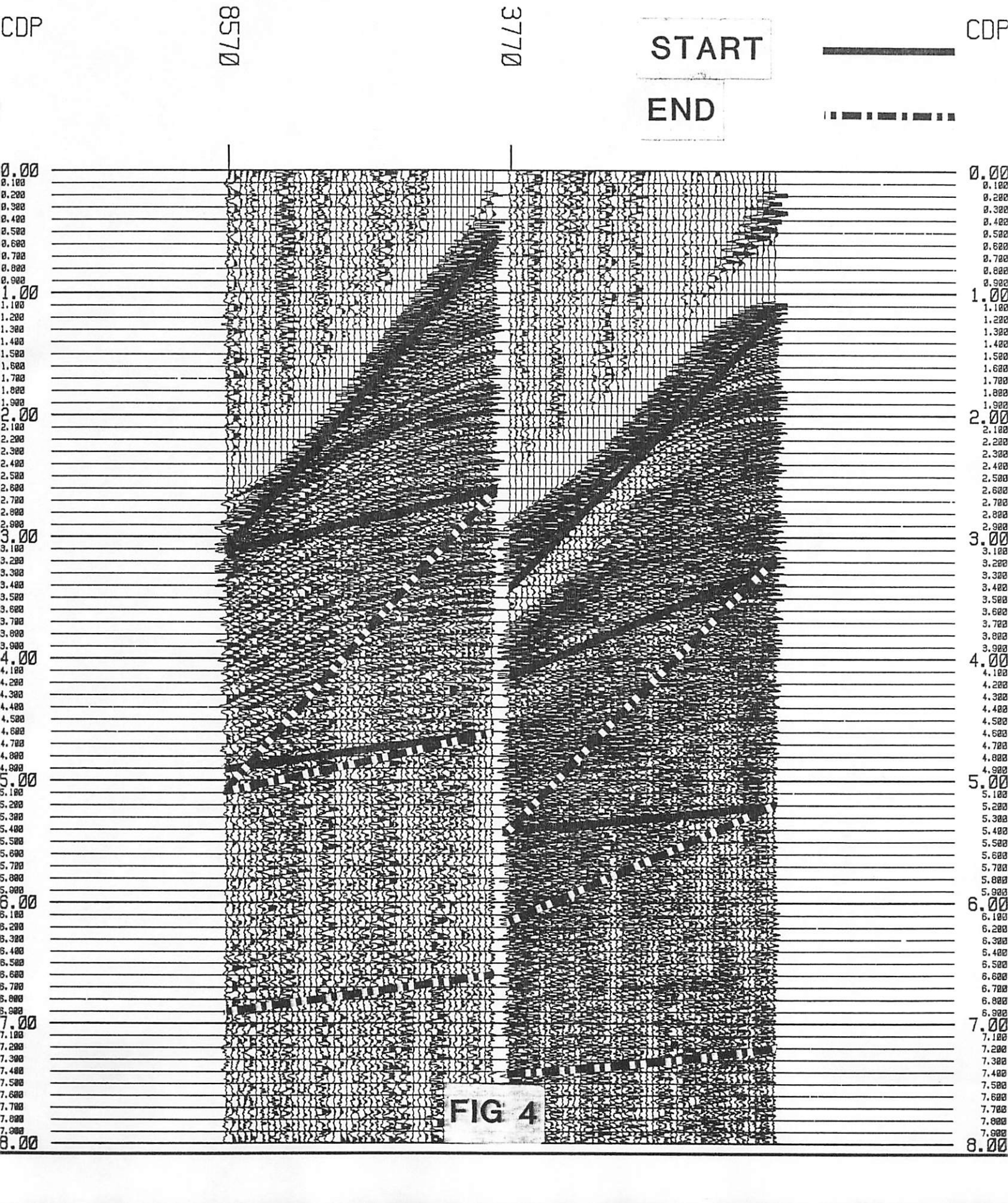
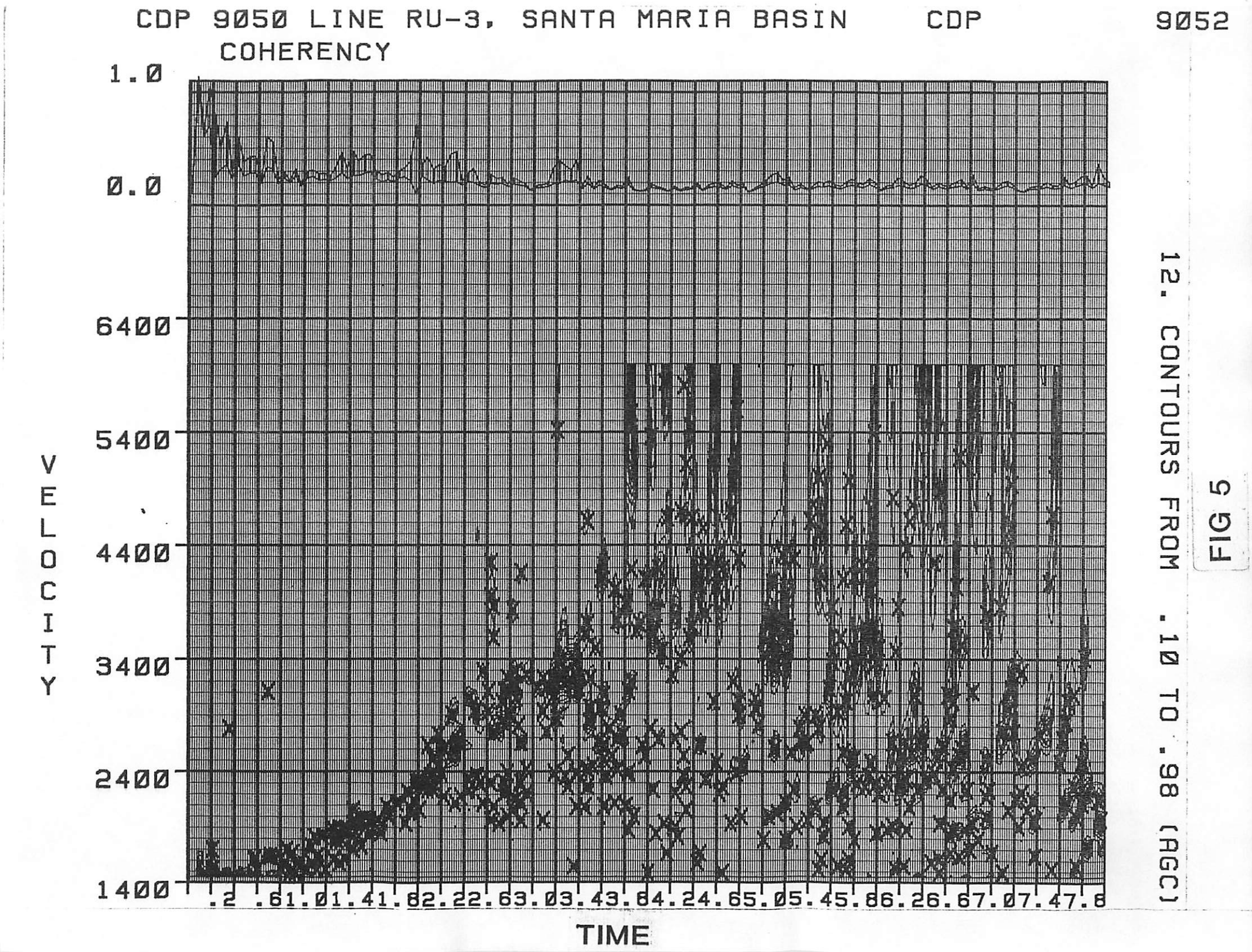
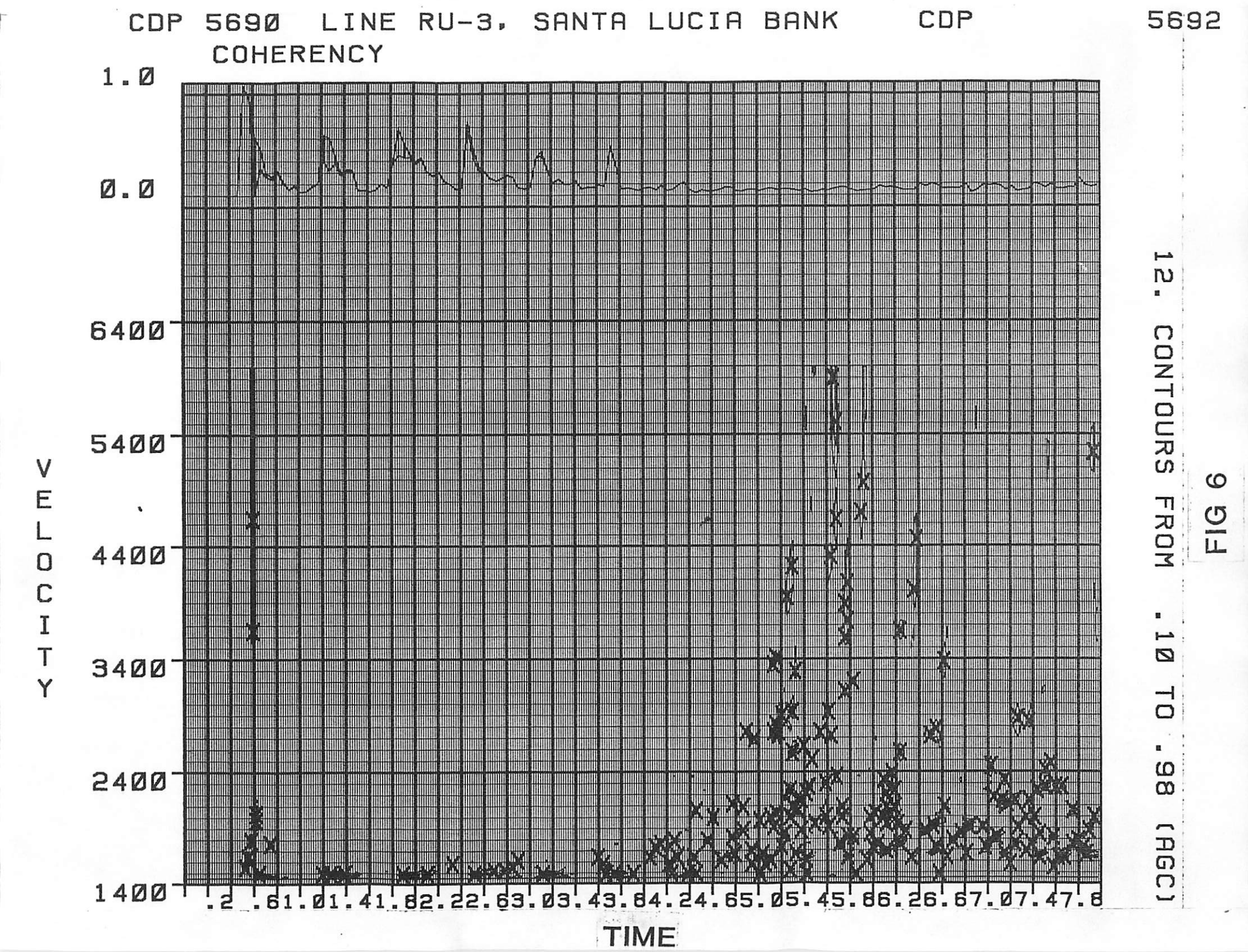


FIG 4


CDP 9050 LINE RU-3, SANTA MARIA BASIN CDP 9052
COHERENCY
1.0
0.0
6400
5400
4400
3400
2400
1400
VELOCITY
.2 .6 1.0 1.4 1.8 2.2 2.6 3.0 3.4 3.8 4.2 4.6 5.0 5.4 5.8 6.2 6.6 7.0 7.4 7.8
TIME
12. CONTOURS FROM .10 TO .98 (AGC)
FIG 5


CDP 5690 LINE RU-3. SANTA LUCIA BANK CDP 5692
COHERENCY
1.0
0.0
6400
5400
4400
3400
2400
1400
VELOCITY
.2 .61.01.41.82.22.63.03.43.84.24.65.05.45.86.26.67.07.47.8
TIME
12. CONTOURS FROM .10 TO .98 (AGC)
FIG 6

NMO CORRECTED GATHERS (CDP 8570 & 3770)

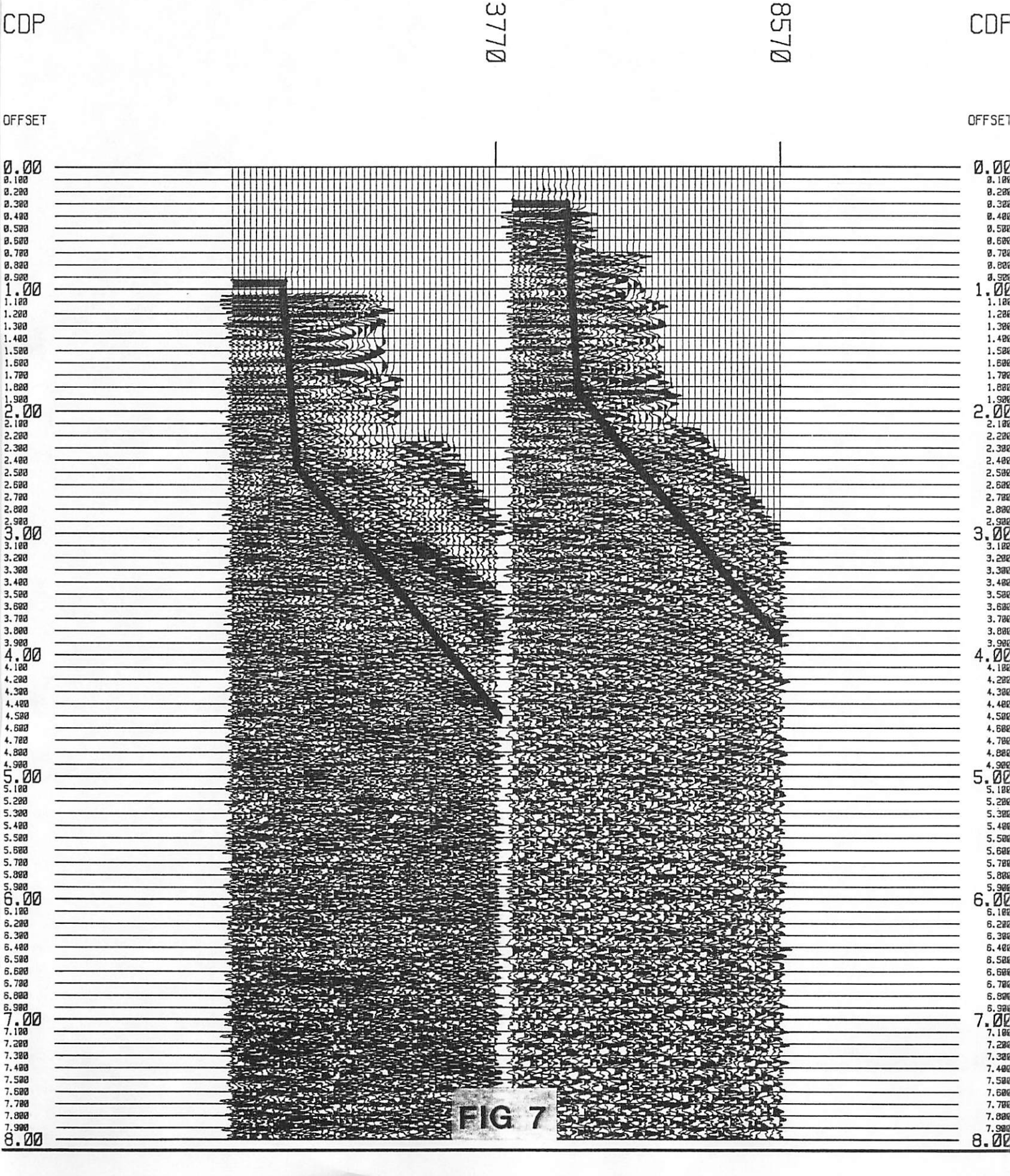


FIG 7

VELEX ANALYSIS CDP 3890

Fig 8

PRE-NMO GATHER OF CDP 3890

OFFSET IN METERS

POST-NMO GATHERS OF CDP 3890 WITH DIFFERENT VEL. FUNCTIONS

1 2 3 4 5 6 7 8 9 10 11

OFFSET IN METERS

POST-NMO STACKS OF CDPS 3900- 3880 WITH DIFFERENT VEL. FUNCTIONS

1 2 3 4 5 6 7 8 9 10 11

CDPS

VELOCITY FUNCTIONS (M/SEC)

REFLECTION TIME (SEC)

OVERCORRECTED CDP GATHERS (CDP 8570 & 3770)

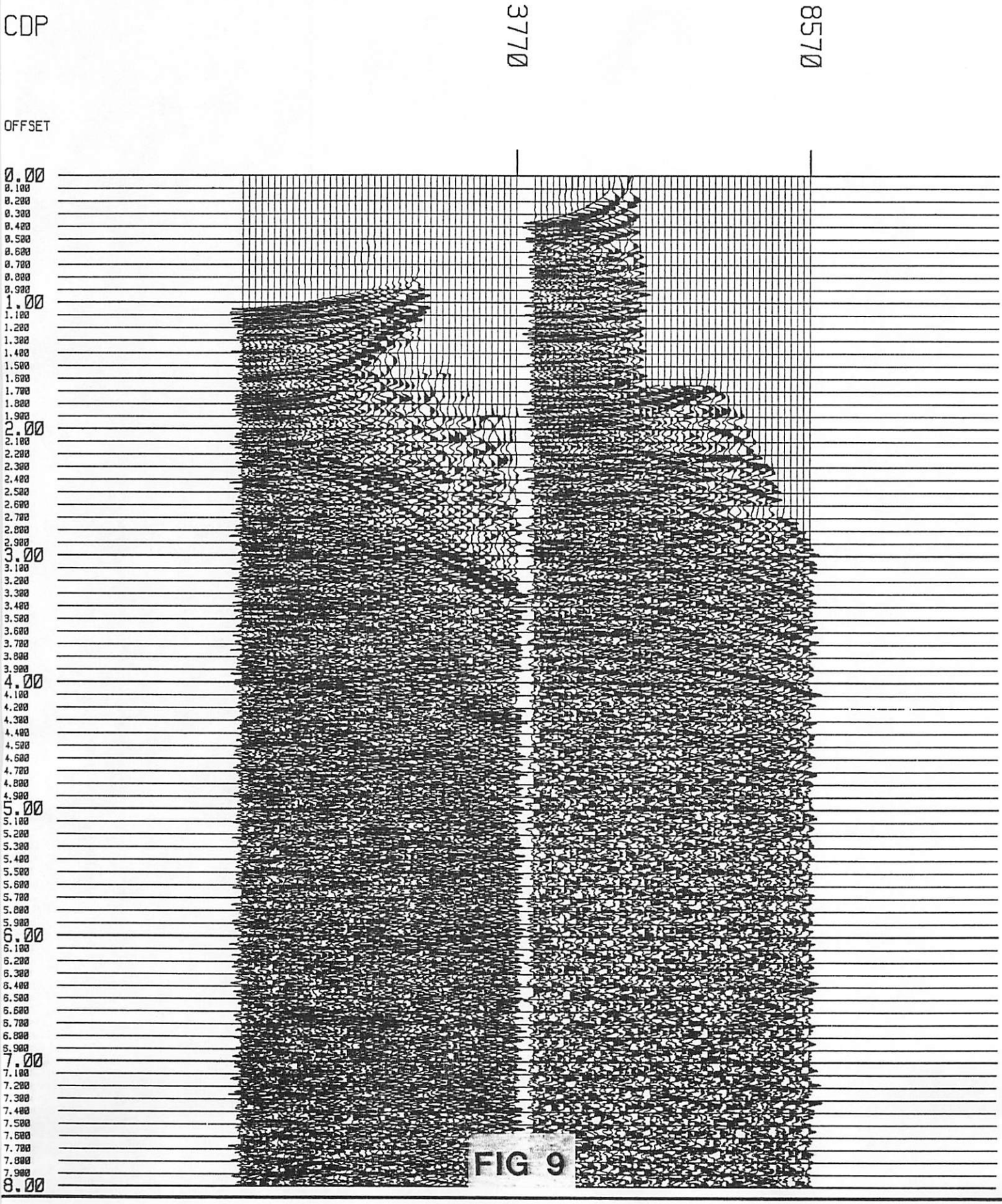


FIG 9

OVERCORRECTED GATHERS AFTER FK FILTER

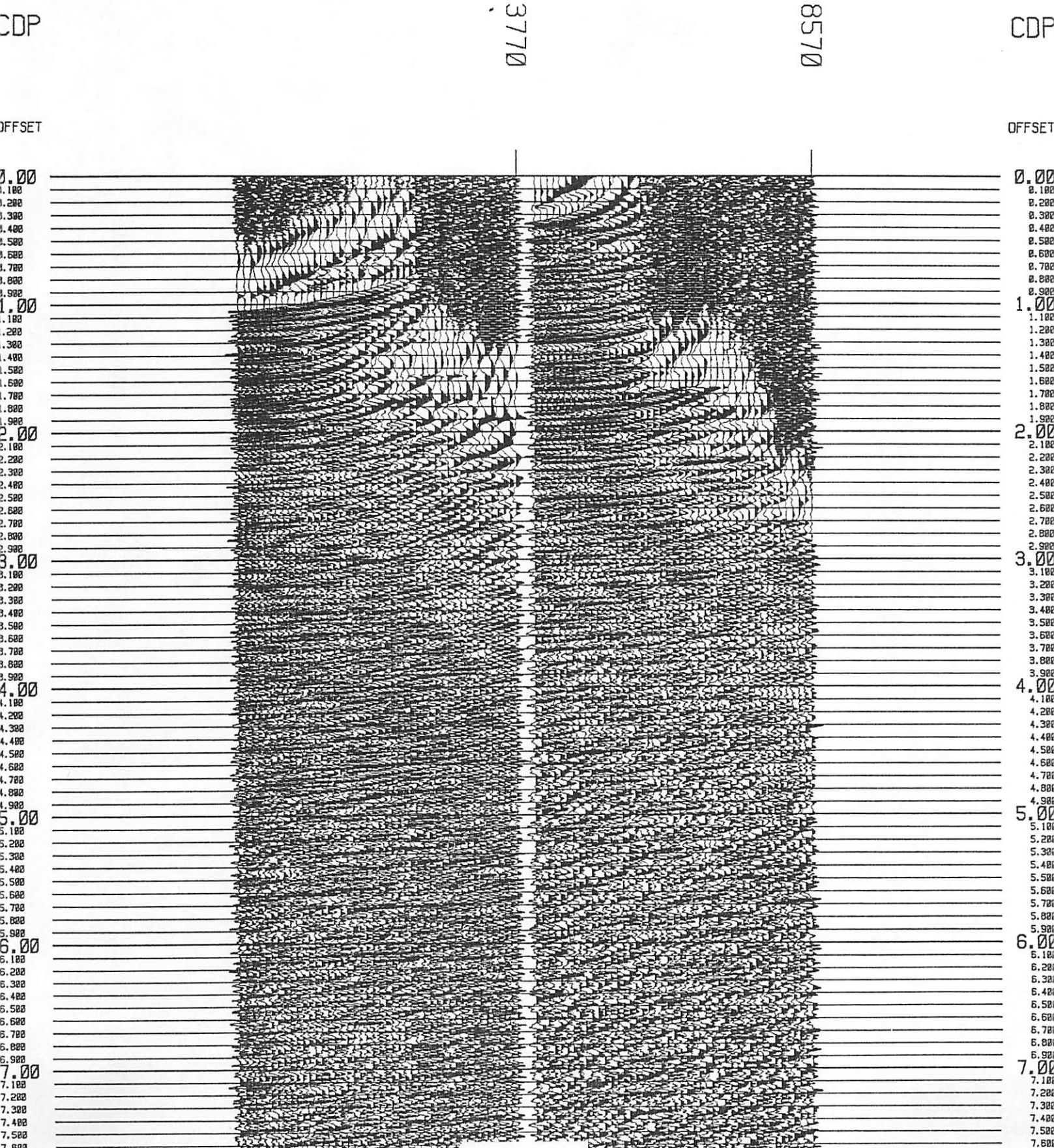


FIG 10

NMO CORRECTED GATHERS AFTER FK FILTER

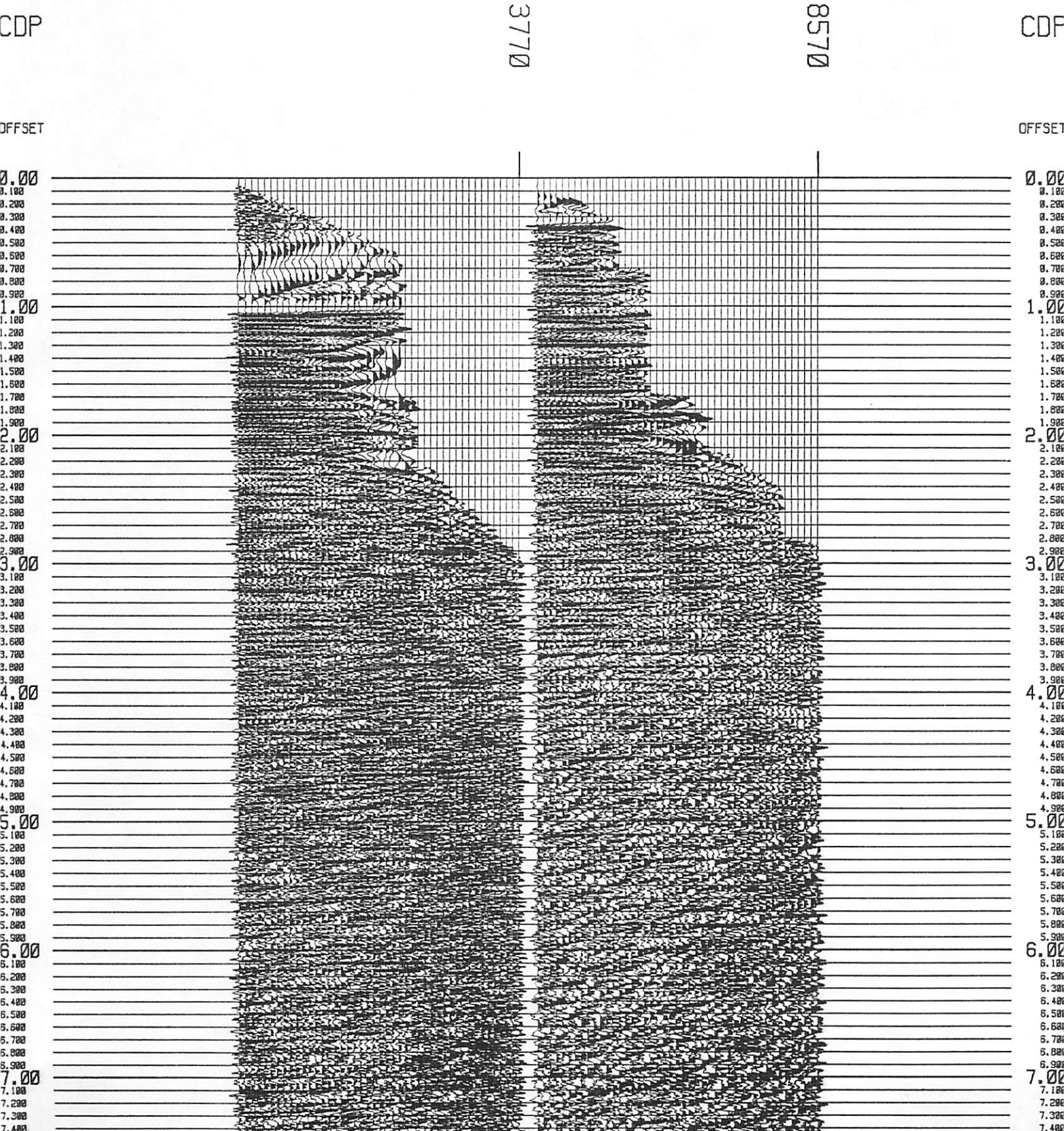


FIG 11

CORRECTED GATHERS AFTER FK FILTER AND MUTE

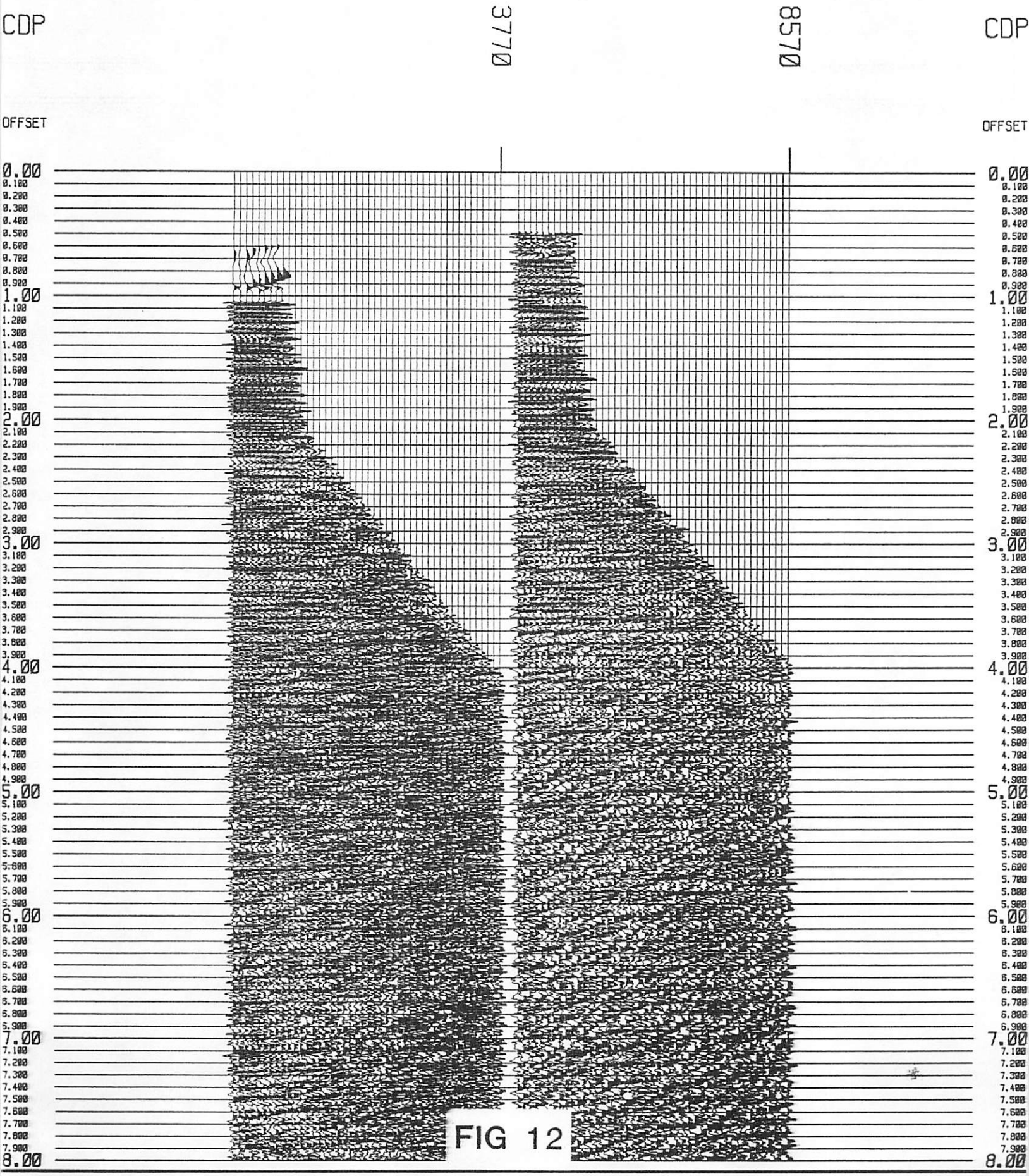


FIG 12

RU-3 CDP 5400-5800 W/ FK FILTER & TVF

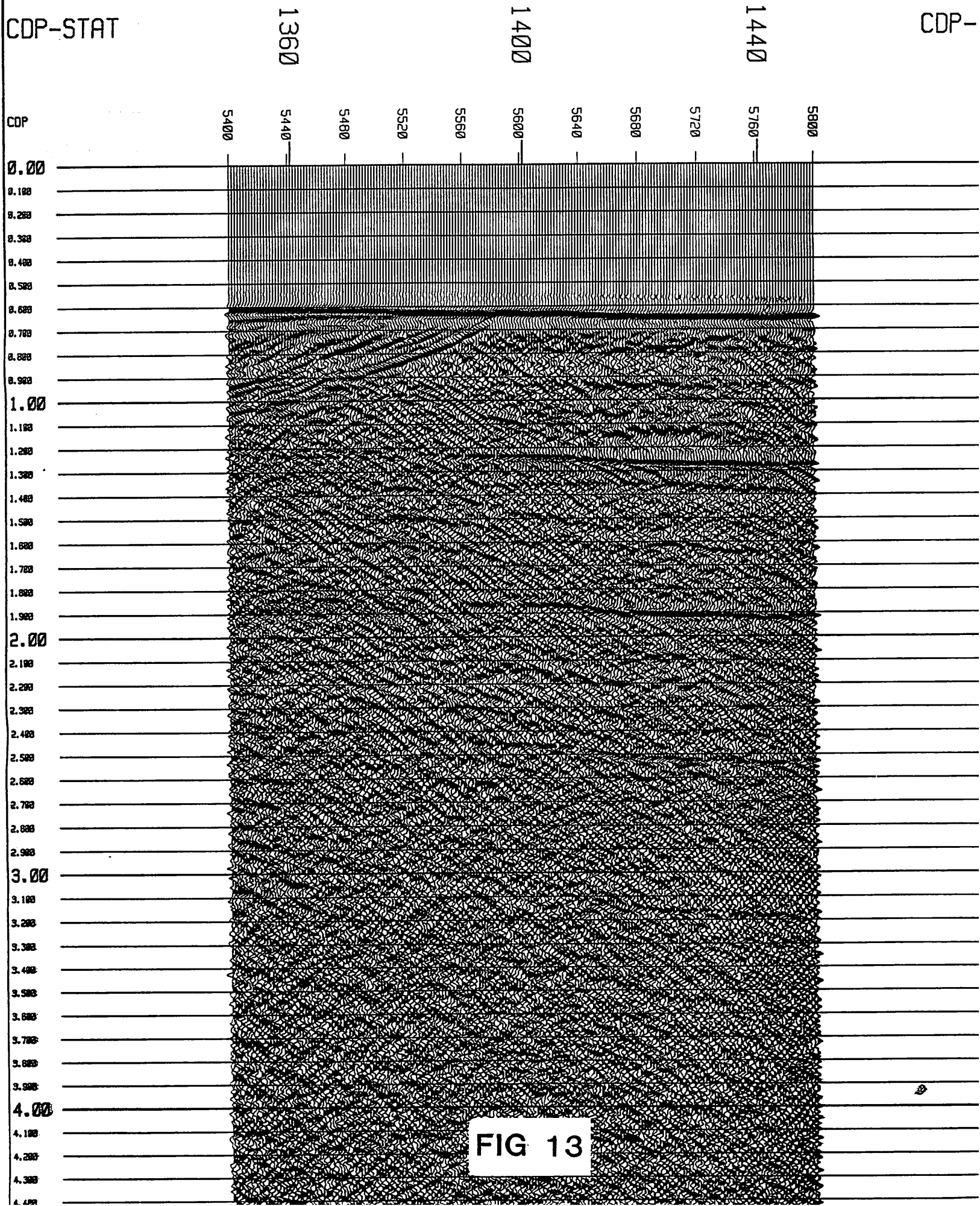


FIG 13

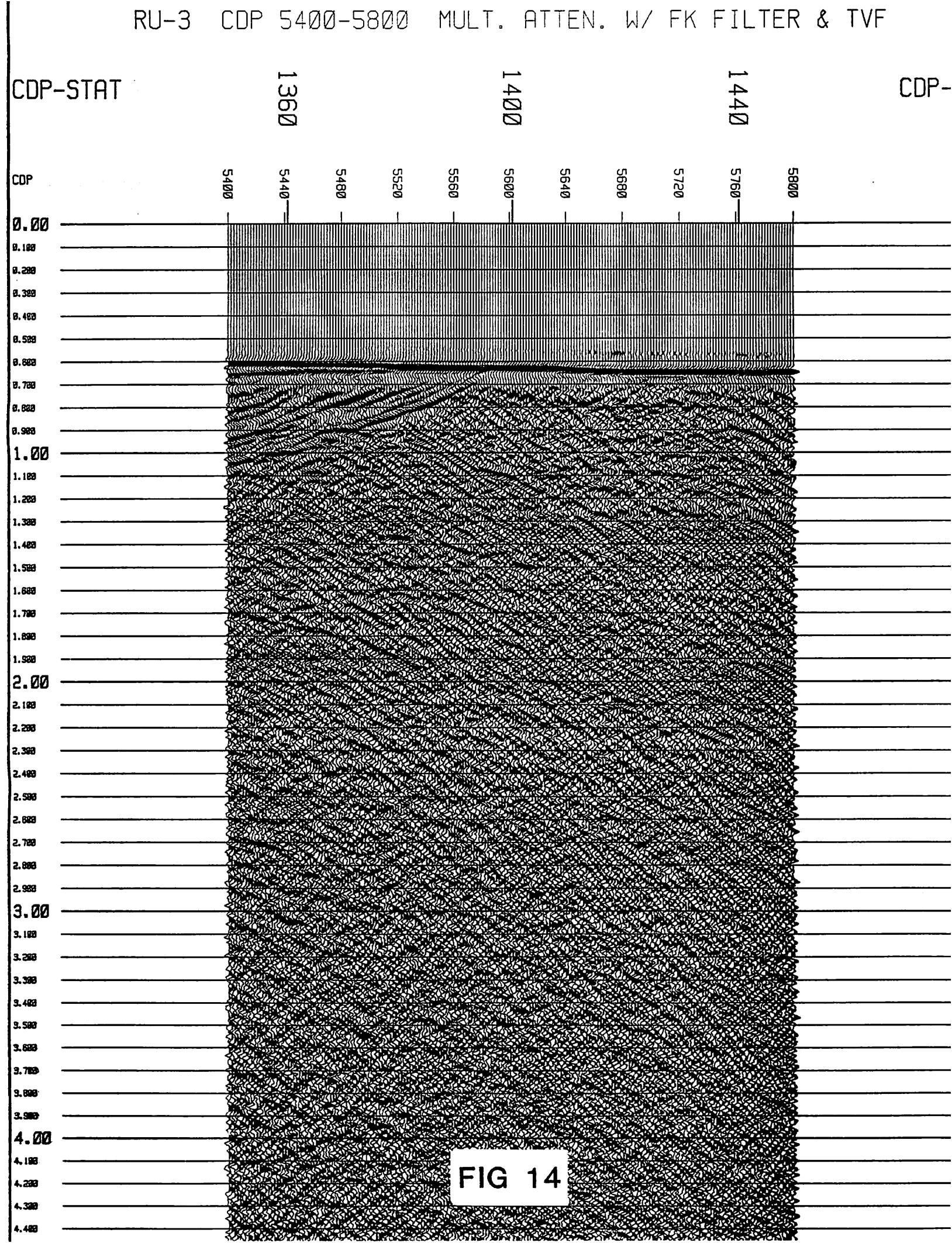

RU-3 CDP 5400-5800 MULT. ATTEN. W/ FK FILTER & TVF
CDP-STAT
1360
1400
1440
CDP-
CDP
5400
5440
5480
5520
5560
5600
5640
5680
5720
5760
5800
0.00
1.00
2.00
3.00
4.00

FIG 14

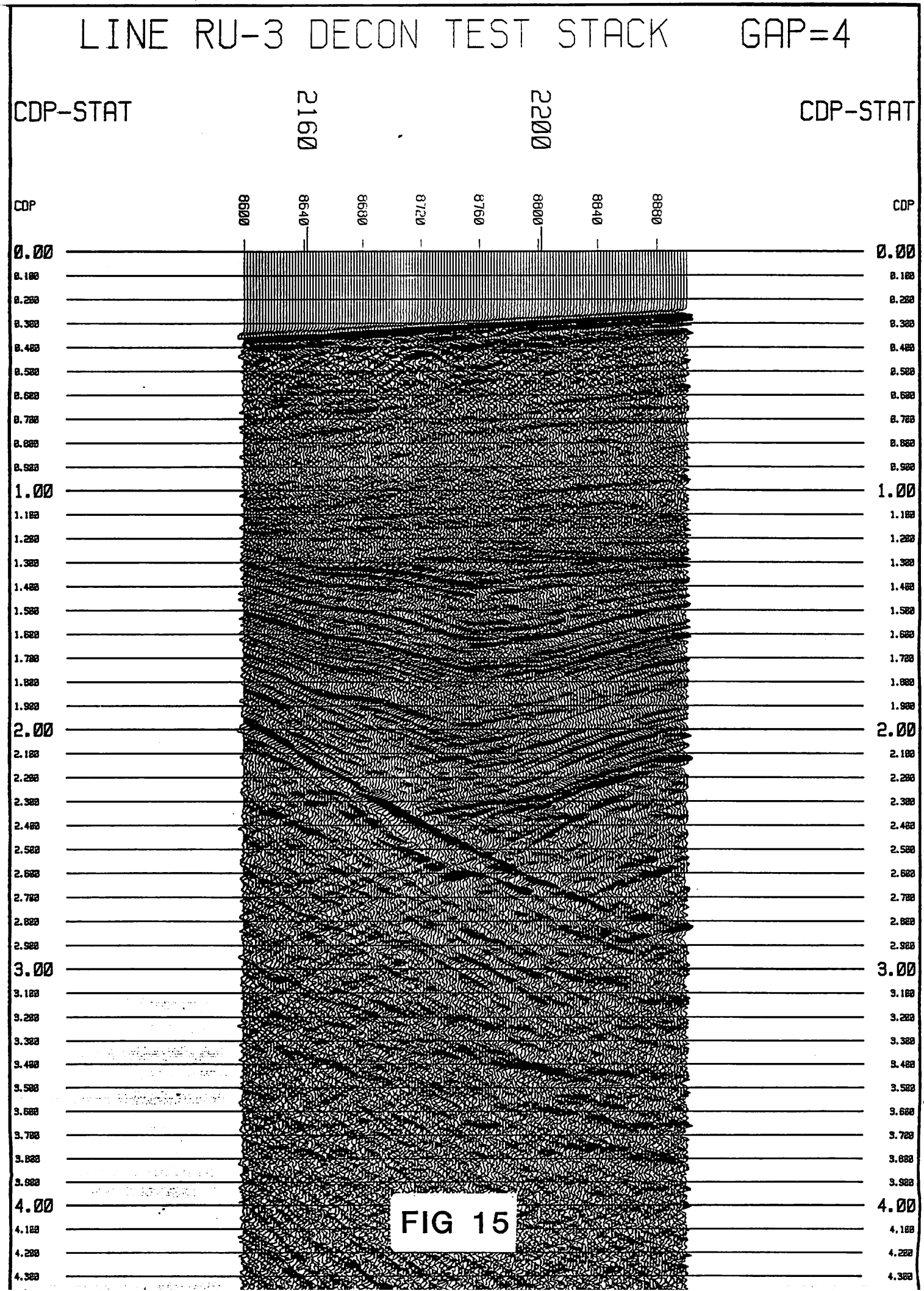

LINE RU-3 DECON TEST STACK GAP=4
CDP-STAT
2160
2200
CDP-STAT
CDP
8600
8640
8680
8720
8760
8800
8840
8880
CDP
0.00
1.00
2.00
3.00
4.00

FIG 15

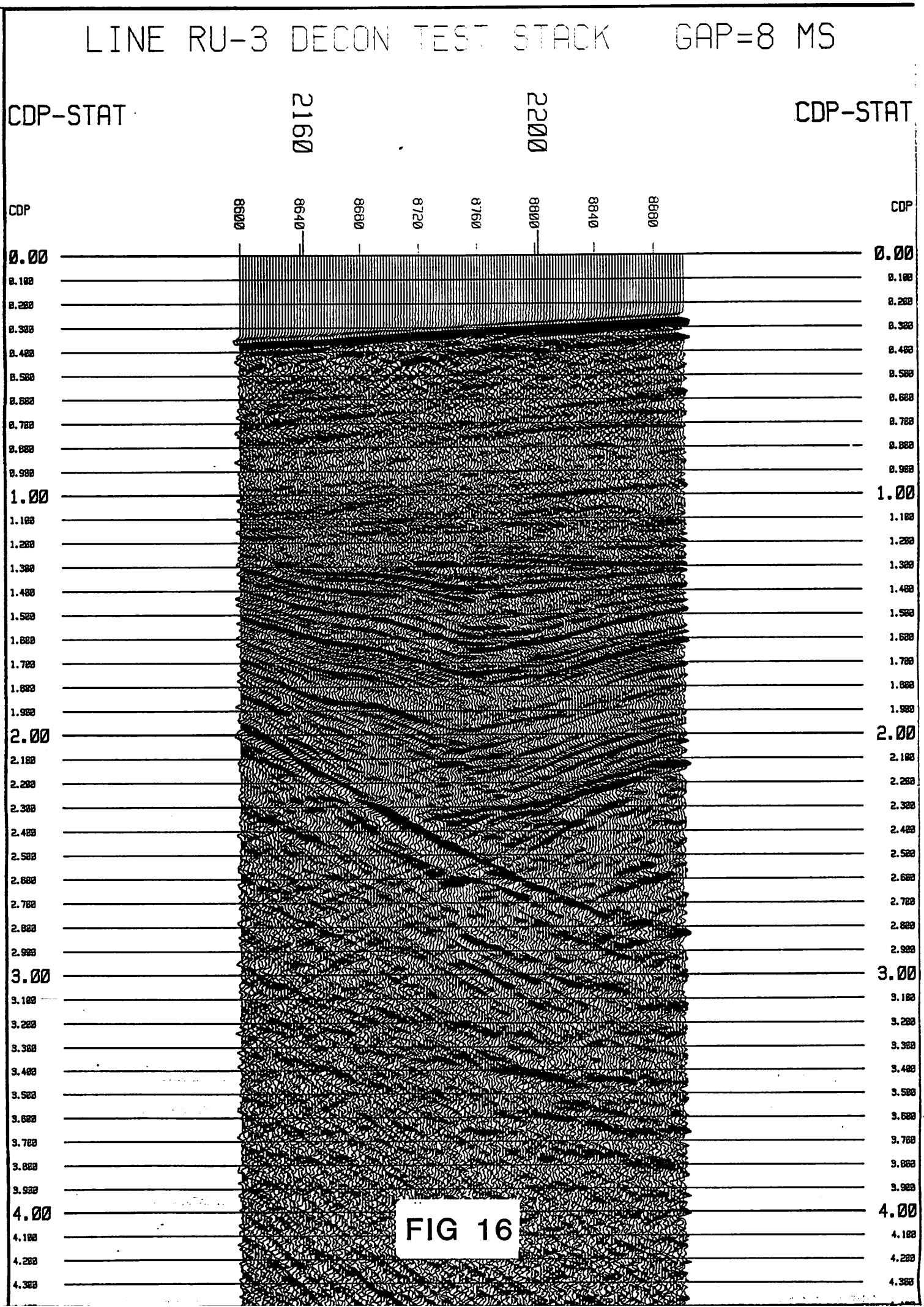

LINE RU-3 DECON TEST STACK GAP=8 MS
CDP-STAT
2160
2200
CDP-STAT
CDP
8600
8640
8680
8720
8760
8800
8840
8880
CDP
0.00
1.00
2.00
3.00
4.00

FIG 16

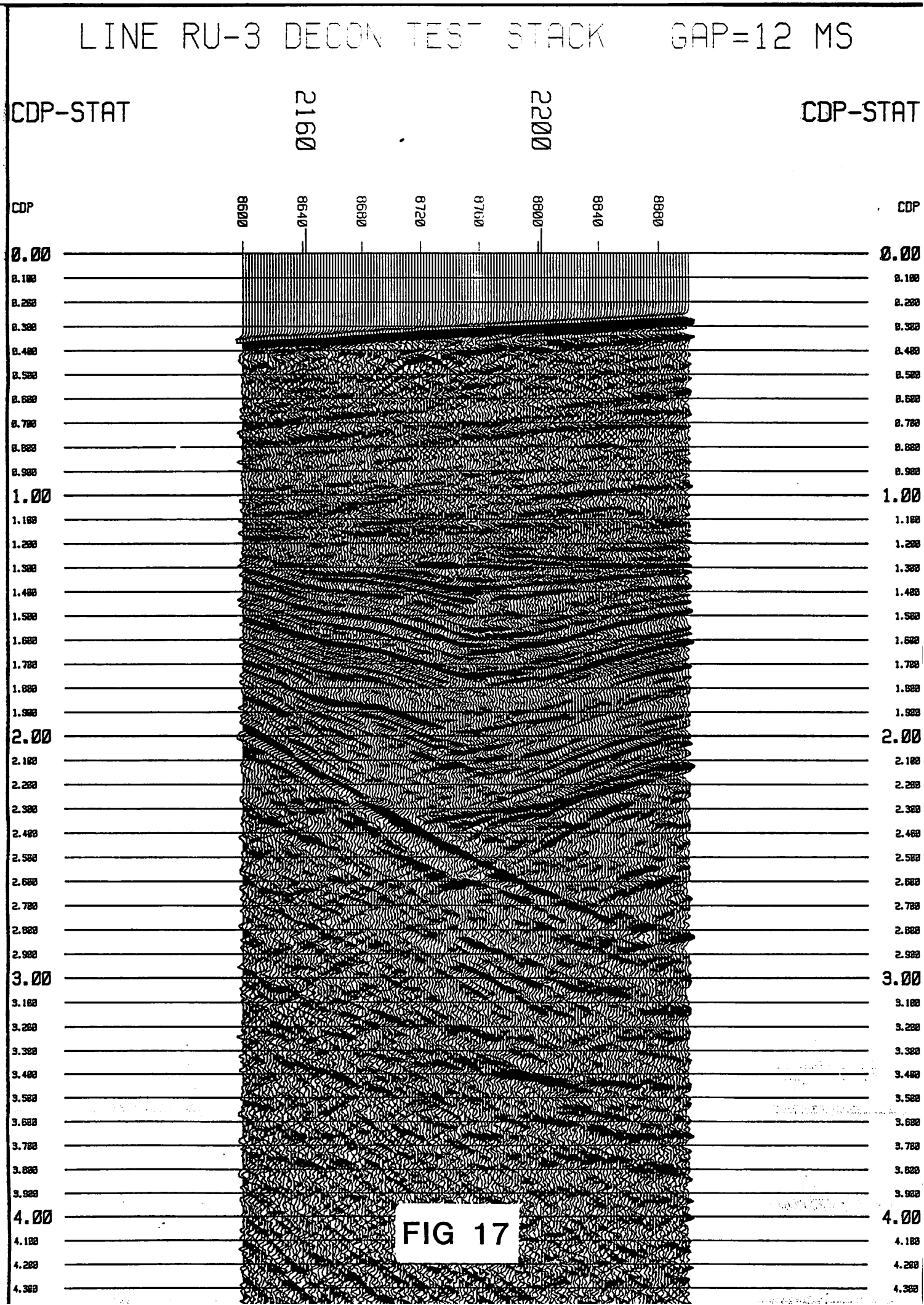

LINE RU-3 DECON TEST STACK GAP=12 MS
CDP-STAT
2160
2200
CDP-STAT
CDP
8600
8640
8680
8720
8760
8800
8840
8880
CDP
0.00
1.00
2.00
3.00
4.00

FIG 17

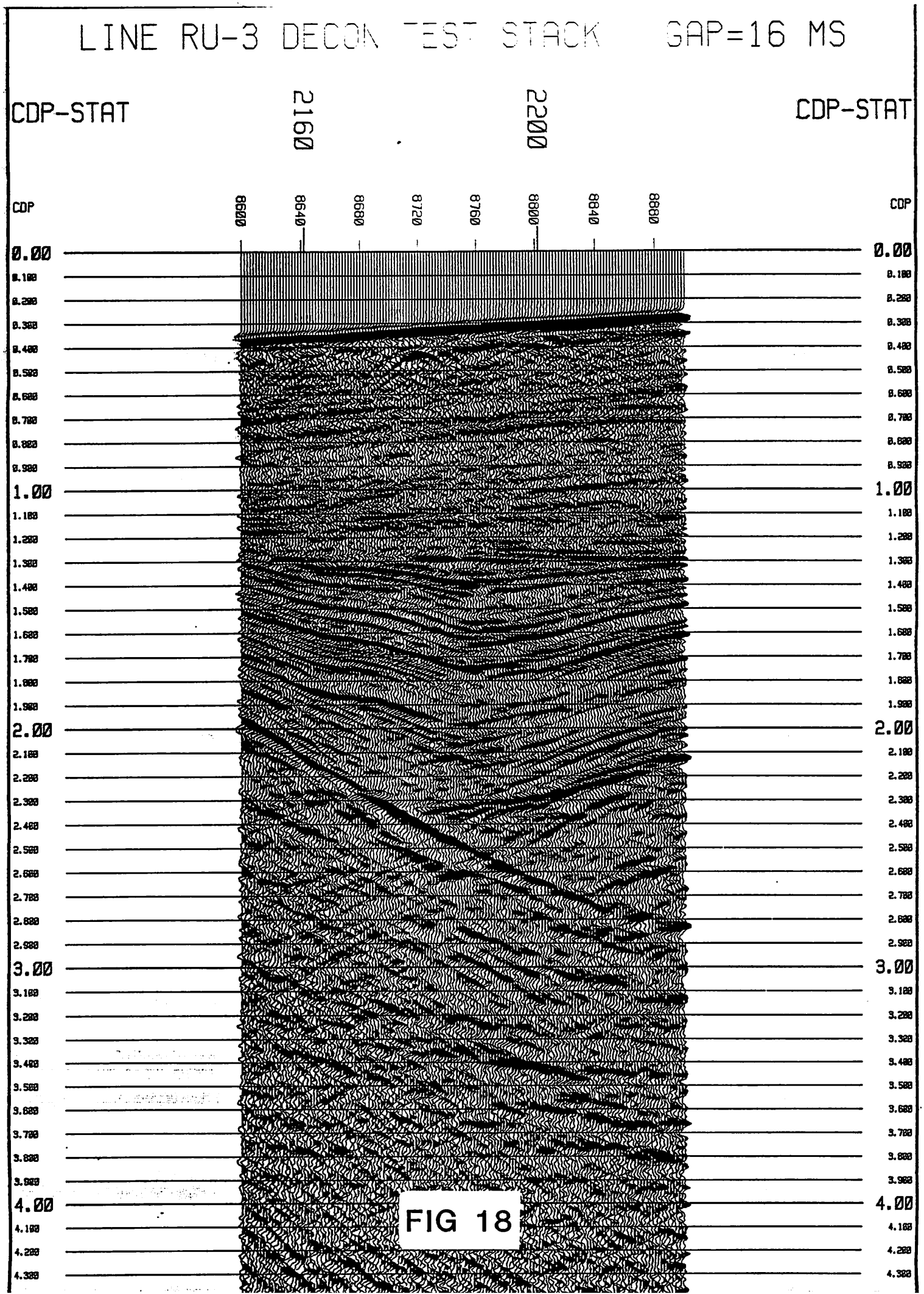

LINE RU-3 DECON TEST STACK GAP=16 MS
CDP-STAT
2160
2200
CDP-STAT
CDP
8600
8640
8680
8720
8760
8800
8840
8880
CDP
0.00
1.00
2.00
3.00
4.00

FIG 18

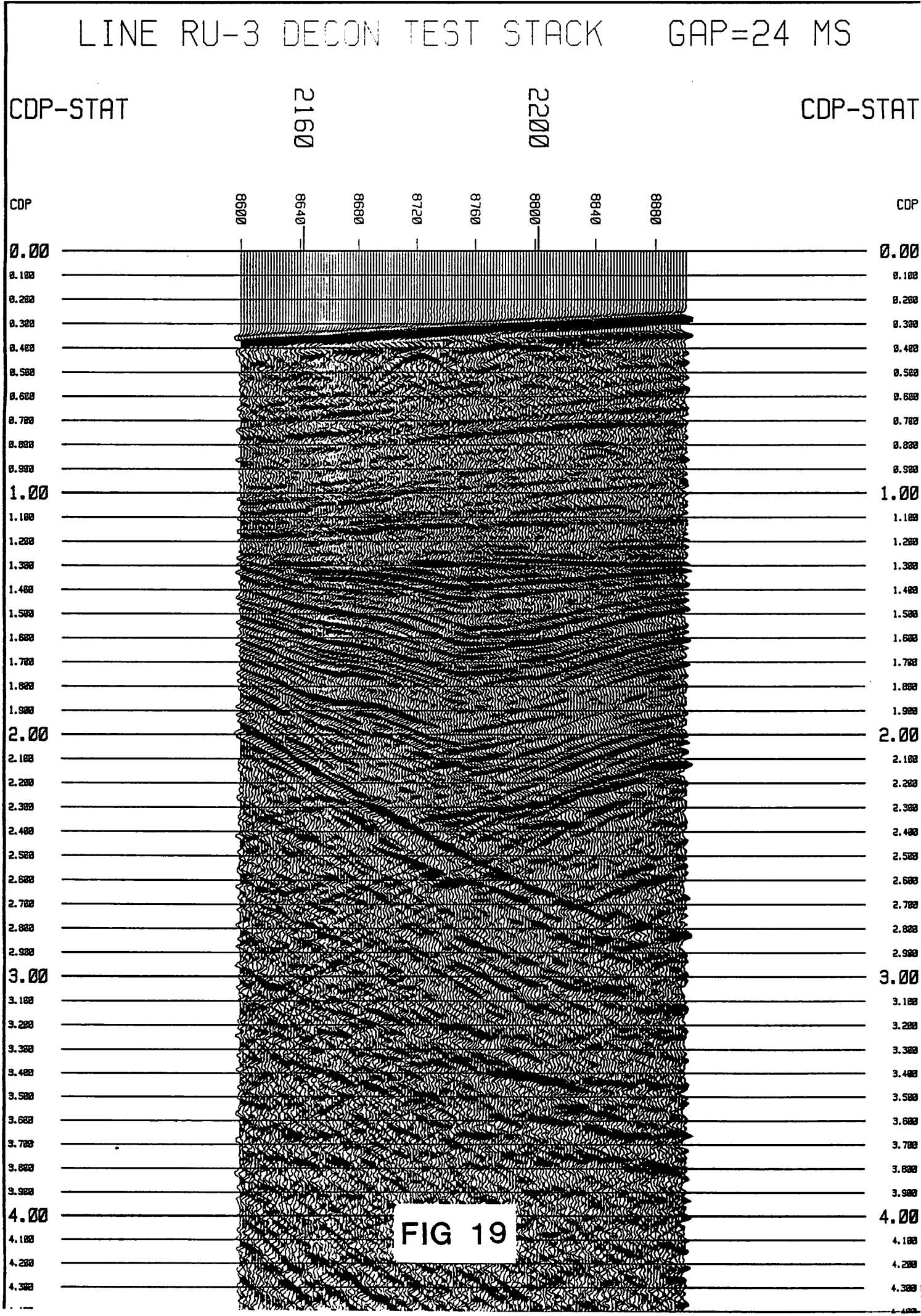

LINE RU-3 DECON TEST STACK GAP=24 MS
CDP-STAT
2160
2200
CDP-STAT
CDP
8600
8640
8680
8720
8760
8800
8840
8880
CDP
0.00
1.00
2.00
3.00
4.00

FIG 19

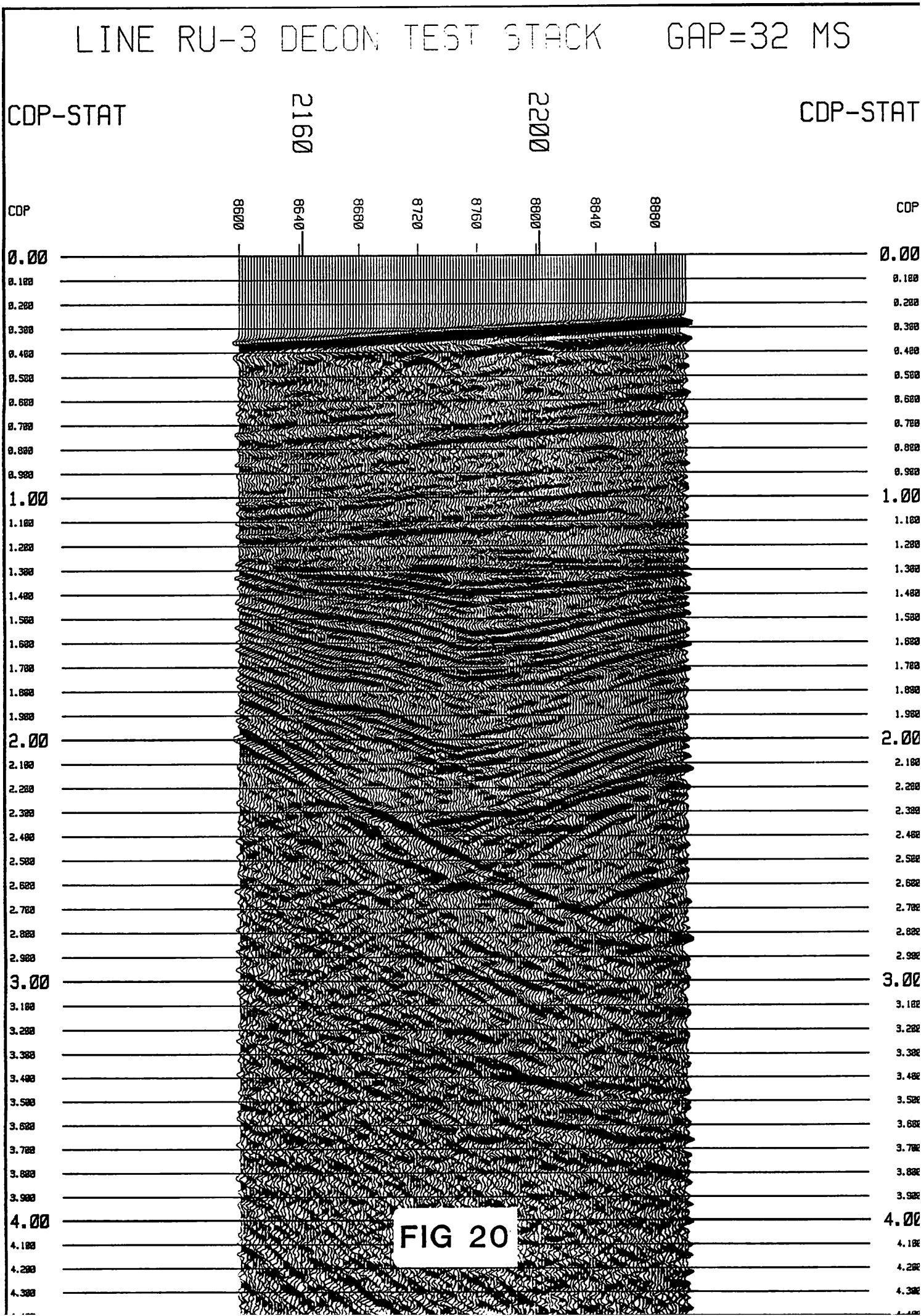

LINE RU-3 DECON TEST STACK GAP=32 MS
CDP-STAT
2160
2200
CDP-STAT
CDP
8600
8640
8680
8720
8760
8800
8840
8880
CDP
0.00
1.00
2.00
3.00
4.00

FIG 20

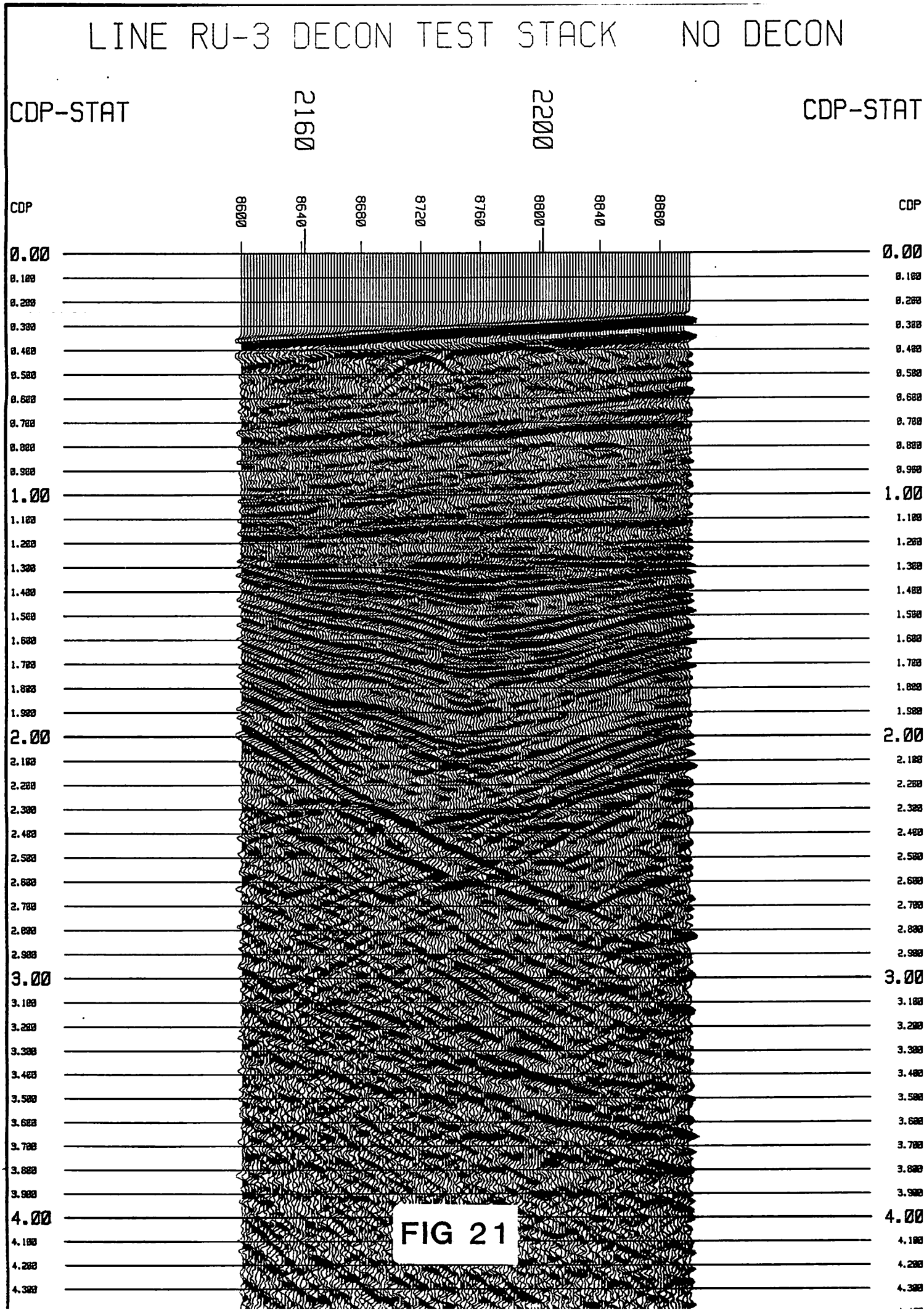

LINE RU-3 DECON TEST STACK NO DECON
CDP-STAT
2160
2200
CDP-STAT
CDP
8600
8640
8680
8720
8760
8800
8840
8880
CDP
0.00
1.00
2.00
3.00
4.00

FIG 21

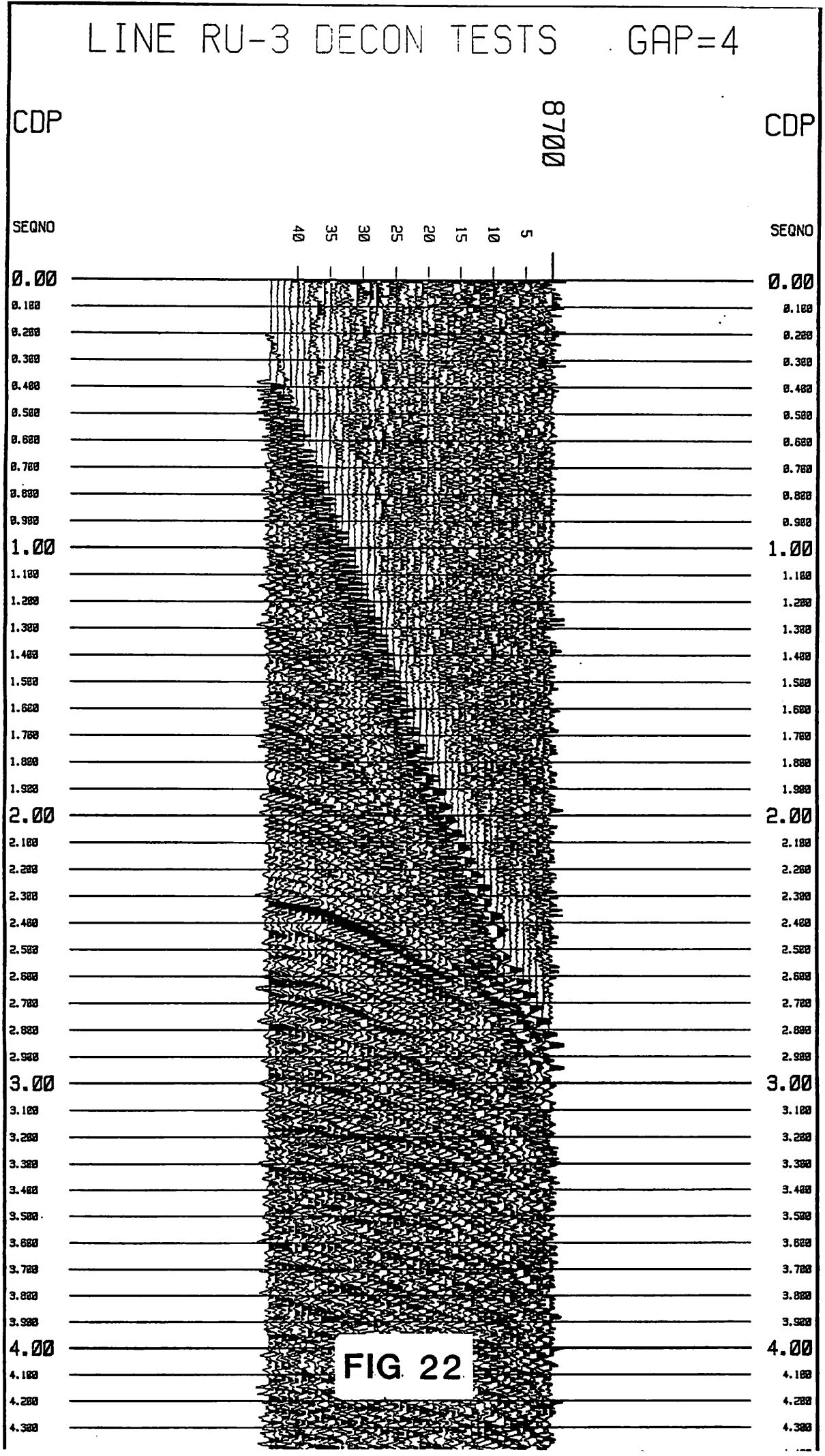

LINE RU-3 DECON TESTS GAP=4
CDP
8700
CDP
SEQNO
40
35
30
25
20
15
10
5
SEQNO
0.00
1.00
2.00
3.00
4.00

FIG. 22

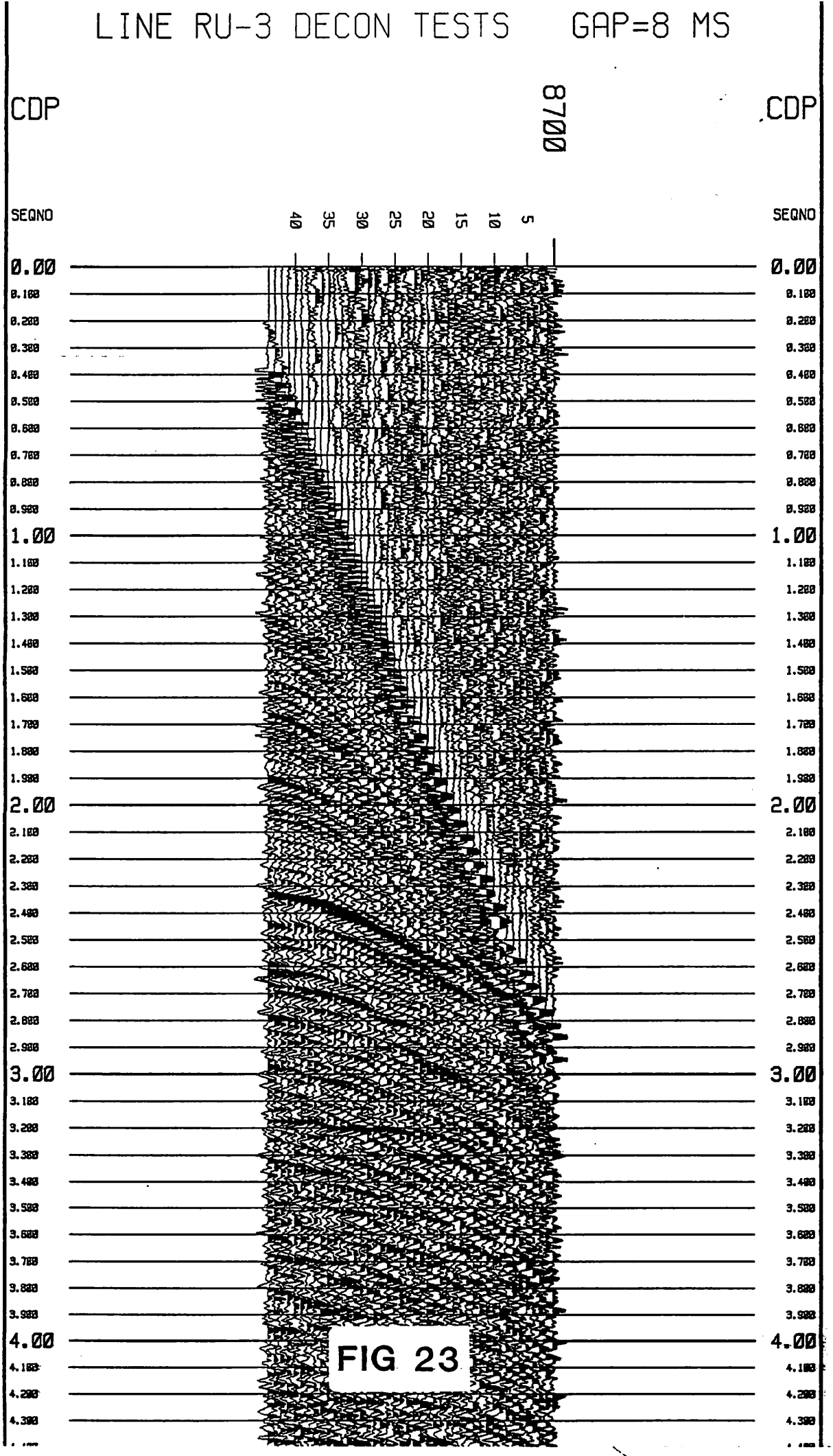

LINE RU-3 DECON TESTS GAP=8 MS
CDP
8700
CDP
SEQNO
40
35
30
25
20
15
10
5
SEQNO
0.00
1.00
2.00
3.00
4.00

FIG 23

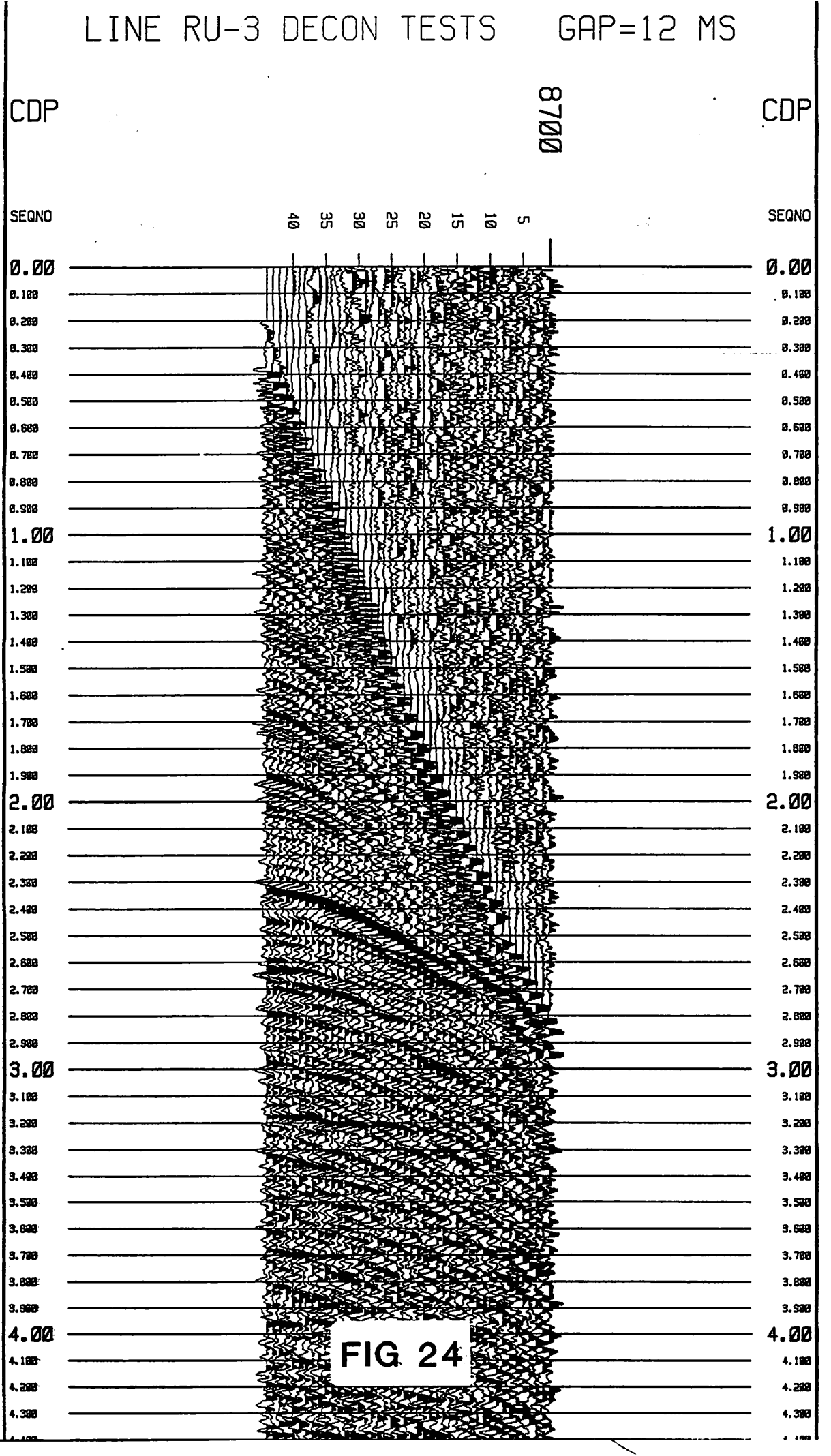
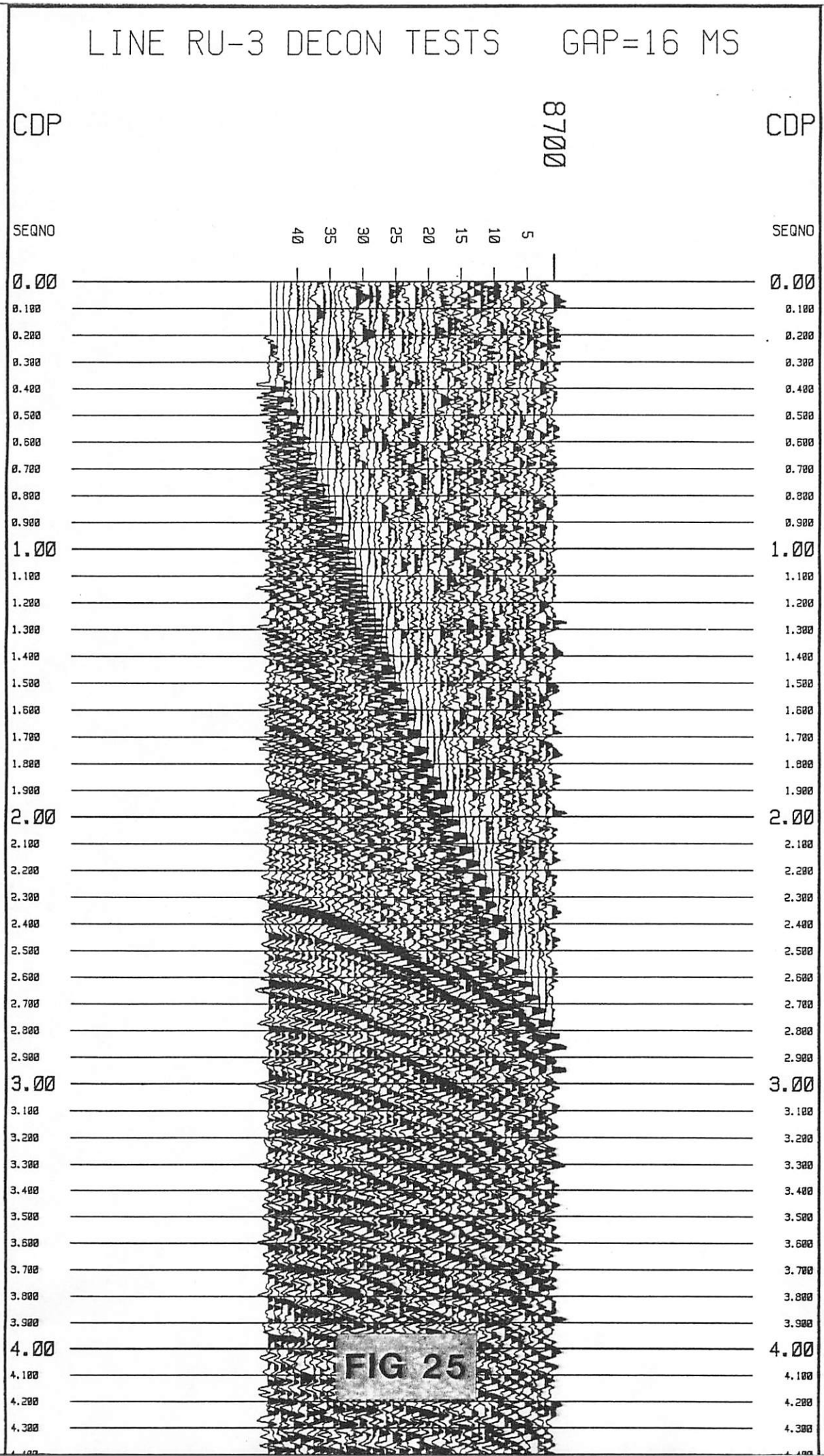

LINE RU-3 DECON TESTS GAP=12 MS
CDP
8700
CDP
SEQNO
40
35
30
25
20
15
10
5
SEQNO
0.00
1.00
2.00
3.00
4.00

FIG 24


LINE RU-3 DECON TESTS GAP=16 MS
CDP
8700
CDP
SEQNO
40
35
30
25
20
15
10
5
SEQNO
0.00
0.100
0.200
0.300
0.400
0.500
0.600
0.700
0.800
0.900
1.00
1.100
1.200
1.300
1.400
1.500
1.600
1.700
1.800
1.900
2.00
2.100
2.200
2.300
2.400
2.500
2.600
2.700
2.800
2.900
3.00
3.100
3.200
3.300
3.400
3.500
3.600
3.700
3.800
3.900
4.00
4.100
4.200
4.300
FIG 25

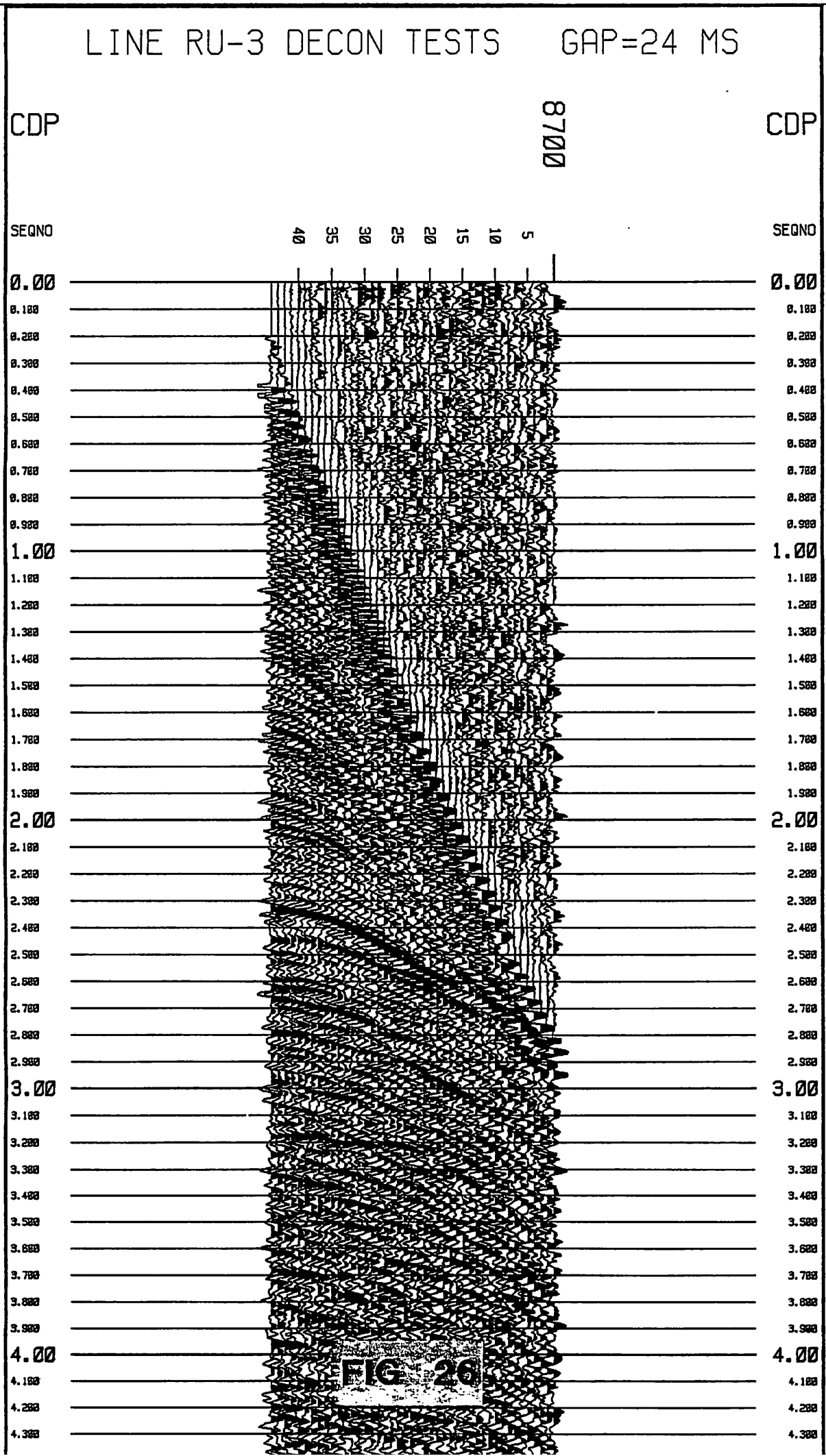
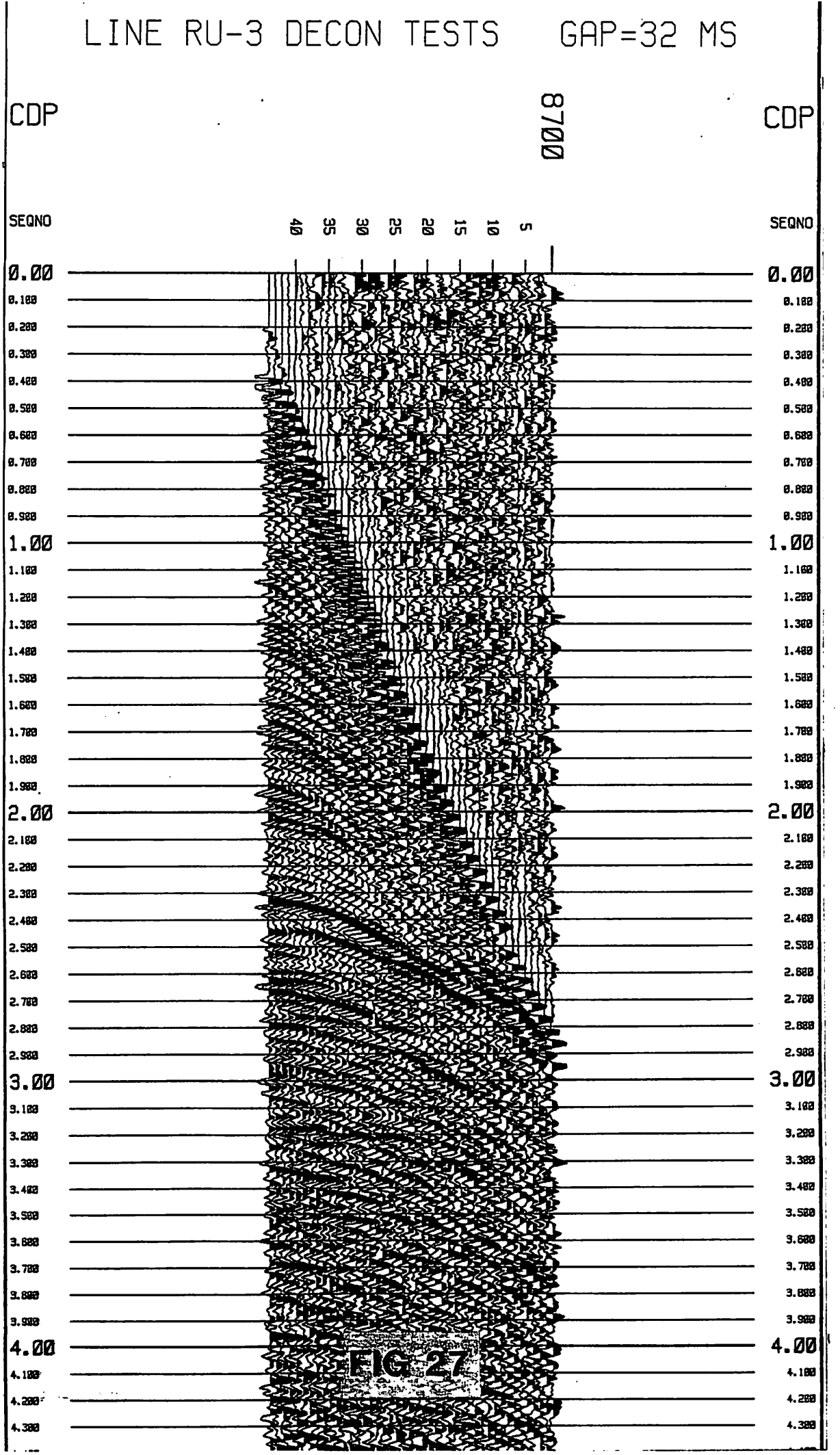

LINE RU-3 DECON TESTS GAP=24 MS
CDP
8700
CDP
SEQNO
40
35
30
25
20
15
10
5
SEQNO
0.00
1.00
2.00
3.00
4.00

FIG 26


LINE RU-3 DECON TESTS GAP=32 MS
CDP
8700
CDP
SEQNO
40
35
30
25
20
15
10
5
SEQNO
0.00
1.00
2.00
3.00
4.00
FIG 27

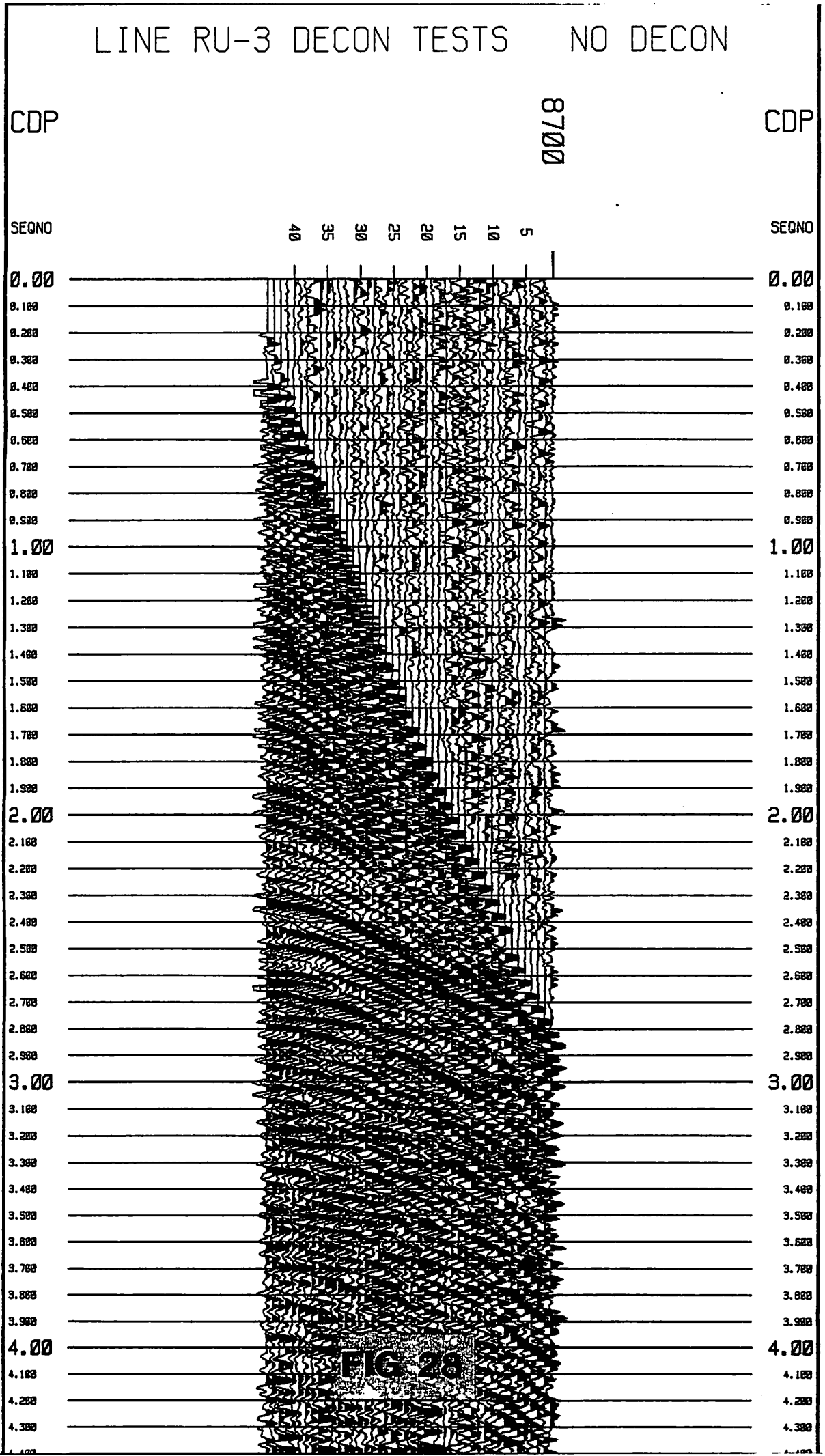

LINE RU-3 DECON TESTS NO DECON
CDP
8700
CDP
SEQNO
40
35
30
25
20
15
10
5
SEQNO
0.00
0.100
0.200
0.300
0.400
0.500
0.600
0.700
0.800
0.900
1.00
1.100
1.200
1.300
1.400
1.500
1.600
1.700
1.800
1.900
2.00
2.100
2.200
2.300
2.400
2.500
2.600
2.700
2.800
2.900
3.00
3.100
3.200
3.300
3.400
3.500
3.600
3.700
3.800
3.900
4.00
4.100
4.200
4.300

FIG 28

APPENDIX A

List of important files in /Subdomain/User/Kirk/RU-3

BRUTSTAK2,
BRUTSTAKH - Job files for preliminary stack
CVAJOB - Job setup for constant velocity stacks.
DEFINE - File containing preliminary stack velocities.
DEFINAL - File containing MASTACK and STRATSTAK velocities also used for intermediate stack but subsequently changed.
FILTHC - Filter tests (Hicut constant)
FILTLC - Filter tests (Lowcut constant)
FULLSTAK - Intermediate stack (16 second records)
MADEFIN - NMO over-correction velocity functions for multiple attenuation processing
MASTACK - Multiple attenuation stack (CDP 9554-752)
MASTACK2 - Multiple attenuation stack (CDP 760-218)
MASTFKDISP - Displays MASTACK with label and filters (FK and TVF)
MASTMIGDISP - Displays migration of MASTACK (MIGRATE) with label
MASTTVFDISP - Display MASTACK with label and TVF
MATEST - Tests multiple attenuation on one CDP gather
MIGRATE - Used to migrate MASTACK
NMOCHEK - Displays NMO-corrected gathers for entire line
OVERCHEK - Displays CDP gathers as processed for multiple attenuation (over-corrected, FK-filtered, corrected, muted)
PLTALL3 - Plots all of preliminary stack (it's in two parts)
SIDELABEL - Parameters and text used to make side labels
SPIKETEST - Filter tests of spiking deconvolution stack
STRATSTAK - Spiking deconvolution stack job (used multiple attenuation gathers from MASTACK job)
STRATDISP - Displays STRATSTAK with label
STRATMIGA - Migration of STRATSTAK (CDP 2000-9554)
STRATMIGADISP - Displays STRATMIGA with label
STRATMIGB - Migration of STRATSTAK (CDP 218-2450)
STRATMIGBDISP - Displays STRATMIGB with label
VELEXJOB - File which was adapted to generate most velex plots
VSTUDYSL - Job used to generate VSTUDY plots southwest of the Santa Lucia Bank Fault
VSTUDYSM - Job used to generate VSTUDY plots for the Santa Maria Basin
VSUM - Job set up to use the VSTACK module to perform a 2 to 1 trace sum after stack.
VSUMEOT - Job which takes output of VSUM and omits every other trace to achieve a smaller display

APPENDIX B

Results output to tape (TAPOUT):

1) Selected CDP gathers (11 CDP every 120 CDP)
   Set: CDPSAMPL
   Reels: CDPSPA, CDPSPB, CDPSPC, SCRTCH

2) CDP gathers following multiple attenuation processing (output from MASTACK)
   Set: MACDP3 VERSION 1 CDP 752-9554
   Reels: MA3A, MA3B, MA3C, MA3D, MA3E, MA3F, MA3G, MA3H, MA3I, MA3J, MA3K, MA3L, MA3M, MA3N
   Set: MACDP3 VERSION 2 CDP 218-760
   Reel: MA3O

3) Intermediate Stack (FULLSTAK: 16 seconds, stacked traces)
   Set: FULLSTAKT
   Reel: FSTAKT

4) Multiple Attenuation Stack (MASTACK; 10 seconds, stacked traces)
   Set: MASTACKT
   Reel: MASTKT

5) MASTACK Migration
   Set: MASTACKMIG
   Reel: MIGRAT

6) Spiking Deconvolution Stack (STRATSTAK; 10 seconds, stacked traces)
   Set: STRATB
   Reel: STACK3

7) STRATSTAK Migration A (STRATMIGA; 4 seconds, stacked traces)
   Set: STRATMIGAT
   Reel: STACK4 (CDP 2000-9554)

8) STRATSTAK Migration B (STRATMIGB; 8 seconds, stacked traces)
   Set: STRATMIGBT
   Reel: STACK5 (CDP 218-2450)

APPENDIX C

Files containing Velocity functions:

1) DEFINE
   Velocity functions used for Preliminary stack (BRUTSTAK).

2) DEFINAL
   Velocity functions used for Intermediate and Final stacks (FULLSTAK, MASTACK, STRATSTAK).

3) MADEFIN
   Velocity functions used to over-correct CDP gathers for multiple attenuation.

4) MIGRDEFA
   Velocity functions used to perform migrations.

```
700      1460     990      1670     1920     2360     2260     2960
3550     3925     5440     4400     7840     5840     8950     6175
HANDVEL  5450     620
670      1490     960      1860     1080     2000     1320     2150
1560     2570     6490     5330
HANDVEL  5690     640
650      1478     750      1525     1030     1650     1380     1900
1630     2220     1900     2350     2200     2450     2740     2660
3020     3075     3630     3720     4550     4275     5880     4940
7200     5600     8100     6075     10000    7000
HANDVEL  5930     760
1320     1560     1510     1650     1680     1740     1970     2075
3800     3560     6280     4625     7400     5100
HANDVEL  6170     770
1320     1560     1510     1650     1680     1740     1970     2075
3800     3560     6280     4625     7400     5100
HANDVEL  6410     780
800      1460     860      1490     1120     1520     1300     1550
1500     1875     3150     2725     3550     3320     3950     3480
4640     3785     6080     5035     10000    6500
HANDVEL  6650     780
1170     1530     1470     1710     2260     2315     3570     2580
4180     3025     5660     4600     7800     5750
HANDVEL  6890     770
780      1465     800      1465     1070     1505     1120     1515
1200     1545     1280     1555     1390     1608     1500     1643
1760     1845     1900     2075     2130     2440     2270     2500
3080     3650     3300     3975     3850     4380     5130     5060
5450     5225     5920     5460     6700     5850     7480     6240
10000    7500
HANDVEL  7130     750
770      1463     1000     1500     1300     1590     1400     1659
1500     1750     1900     2275     2900     3050     4400     4400
4500     4500     5600     5475     6500     6500     7300     7000
9100     7275     10000    7500
HANDVEL  7370     720
1150     1580     1370     1620     1510     1650     1850     1825
1970     1890     2180     2130
HANDVEL  7580     620
1130     1565     1300     1625     1490     1720     1680     1775
1800     1800     1900     1885     2070     1980     2135     2100
2260     2250     2330     2325     2370     2490     5100     4050
6500     5430
HANDVEL  7610     670
970      1530     1150     1560     1250     1590     1410     1625
1550     1680     1750     1720     1830     1775     1940     1865
2205     2125     2280     2225     2350     2275     2470     2520
2950     2830     4460     3600     5060     4050     7830     5320
HANDVEL  7850     620
1130     1565     1300     1625     1490     1720     1680     1775
1800     1800     1900     1885     2070     1980     2135     2100
2260     2250     2330     2325     2370     2490     5100     4050
6500     5430     10000    6500
HANDVEL  8090     560
850      1535     1055     1565     1370     1710     1510     1740
1750     1860     1920     1950     4630     3000
HANDVEL  8330     490
910      1560     980      1590     1200     1680     1390     1750
1730     1860     1890     2010     2090     2180     2205     2490
6460     5370
HANDVEL  8570     400
840      1565     1100     1675     1300     1740     1460     1830
1660     1845     1800     2010     1970     2275     2045     2440
6400     5375
HANDVEL  8810     320
720      1580     1100     1720     1620     1930     1770     1980
2060     2250     2160     2325     2370     2640     2760     3575
3410     3990     3650     4560     3810     4825
HANDVEL  9050     270
380      1590     730      1625     1100     1800     1350     1890
1560     1950     1750     1980     1850     2125     1990     2320
2350     2670     3340     3425     4560     4230     6410     5640
10000    7000
*END
```

```
*JOB     SM      LINE3   KDM     DEFINE
*CALL    DUMIN
*CALL    DEFINE  CDP     1460    INV     3DEFINE TVRMS   LINE3
HANDVEL 410      5190
5330     1480    5520    1490    5730    1520    5850    1550
6030     1640    6240    1675    6480    1800    6570    1940
6750     2325    7010    2960    8300    3990    9310    5400
HANDVEL 650      5250
5860     1540    6060    1570    6190    1620    6260    1670
6820     2150    7230    2540    8640    4100    9530    5090
HANDVEL 890      5240
5450     1520    6190    1580    6700    1670    6980    1900
7460     2660    8180    3525
HANDVEL 1130     5210
5230     1480    5810    1520    5970    1550    6190    1580
6390     1615    6810    1790    7420    2690    9260    5210
HANDVEL 1370     5180
5200     1480    5360    1490    5570    1520    5830    1550
6090     1580    6430    1800    6630    2090    6910    2620
7030     2900    8800    4515    9360    5370
HANDVEL 1850     3620
3820     1490    4030    1520    4230    1640    4530    1770
4750     1975    5160    2720    8620    6050
HANDVEL 2090     2710
3000     1490    3260    1550    3450    1700    3790    1900
4630     2630    6580    4340    7200    4750    7980    5450
9770     6200
HANDVEL 2330     1400
1430     1500    1600    1515    1770    1600    1890    1620
1970     1780    2150    1845    2330    2010    2380    2170
2940     3175    4270    3915    4740    4500    5180    5080
7160     6075    7750    6375    8900    6950    10000   7500
HANDVEL 2570     1130
1150     1460    1290    1490    1460    1575    1610    1675
1680     1725    1850    1825    2180    2240    3810    3325
4770     4790    6030    5875
HANDVEL 2810     1160
1320     1490    1700    1675    1820    1730    1890    1815
2320     2180    4100    3290    6530    5390    7400    5620
HANDVEL 3050     1250
1300     1460    1560    1550    2400    1790    4300    3620
6640     5060    9280    7000
HANDVEL 3290     1130
1510     1610    1830    1820    4600    4250    6600    5420
7360     6350    8900    7000
HANDVEL 3530     940
1030     1490    1310    1650    1800    2000    2490    2540
4250     3820    6140    5125    9230    7000
HANDVEL 3650     980
1010     1460    1180    1485    1290    1580    1420    1625
1730     1880    2090    2180    2140    2275    2310    2395
2480     2425    2610    2475    2690    2690    2800    2950
4850     4400    6270    5450    7540    6580
HANDVEL 3770     1060
1240     1490    1410    1580    1680    1790    4200    3860
6120     5660    9600    6900
HANDVEL 4010     1270
1300     1460    1720    1710    2040    1970    2280    2180
4700     4400    5640    4970    6820    5430    8300    6590
HANDVEL 4250     1050
1620     1690    1770    1820    1940    1880    2710    2570
4290     4130    5450    4910    6580    5480    8730    6950
HANDVEL 4490     760
890      1490    1200    1550    1520    1815    1830    2100
2150     2390    2450    2720    5240    4370    7750    6050
9670     6700
HANDVEL 4730     650
740      1490    1050    1550    1370    1790    1950    2300
3430     3350    4600    3750    5800    4700    6120    5060
6480     5750    7490    6230    9200    7000
HANDVEL 4970     600
620      1500    1200    1525    1500    1550    1670    1730
2800     2250    3350    2781    3900    3100    4350    3412
6320     5310    7730    5950    8500    6300    10000   6650
HANDVEL 5210     620
630      1480    840     1520    1420    2060    1520    2215
2610     3050    4580    3500    6160    4400    7510    5125
9400     5500
HANDVEL 5330     600
```

```
*JOB     SM      LINE3   KDM     DEFINAL
*CALL    DUMIN
*CALL    DEFINE  CDP     1460    INV     DEFINAL TVRMS   LINE3
HANDVEL  218
5205     1465    5270    1470    5350    1475    5550    1475
5740     1500    6010    1625    6150    1760    6320    1920
7040     2300    7220    2440    7550    2925    8250    3575
8750     4000    10000   4500    13000   5510    16000   6050
HANDVEL  410
5205     1465    5270    1470    5350    1475    5550    1475
5740     1500    6010    1625    6150    1760    6320    1920
7040     2300    7220    2440    7550    2925    8250    3575
8750     4000    10000   4500    13000   5510    16000   6050
HANDVEL  670
5270     1475    5400    1475    5490    1480    5595    1490
5660     1495    5810    1550    5900    1560    6000    1570
6080     1600    6115    1605    6410    1850    6740    2170
7200     2610    8300    3670    10000   4400    13000   5450
16000    6130
HANDVEL  890
5260     1490    5370    1500    5460    1505    5590    1510
5975     1527    6180    1580    6375    1650    6535    1670
6600     1750    6790    1950    6910    2000    7190    2110
7390     2720    7810    3225    8200    3643    8700    4050
10000    4400    13000   5450    16000   6130
HANDVEL  1130
5235     1490    5440    1490    5580    1510    5750    1530
5970     1555    6050    1575    6200    1605    6360    1605
6490     1690    6600    1730    6680    2000    7200    2325
7400     2725    7750    3233    8550    3675    10000   4400
13000    5450    16000   6130
HANDVEL  1370
5200     1490    5280    1520    5410    1525    5575    1535
5650     1605    6000    1625    6480    1875    6650    1975
6900     2930    7200    3135    8500    4172    10000   4800
13000    5700    16000   6310
HANDVEL  1490
4950     1515    4990    1515    5040    1500    5115    1505
5400     1505    5600    1620    5720    1780    5920    1800
6090     2055    6320    2085    6590    2165    6810    2300
7040     2350    7230    2400    8100    2780    9600    3485
10000    4000    13000   5200    16000   5830
HANDVEL  1610
4580     1560    4645    1530    4730    1500    4850    1515
5130     1615    5480    1630    5750    2250    5900    2275
6000     2300    6095    2315    6335    2410    6800    2943
8180     4050    10000   4600    13000   5570    16000   6100
HANDVEL  1730
4050     1515    4100    1500    4185    1585    4380    1625
4610     1680    4950    1760    5160    2200    5330    2260
6250     2515    7000    3020    8000    4000    9000    4400
10000    4750    13000   5670    16000   6170
HANDVEL  1850
3640     1515    3960    1540    4400    1650    4550    1775
4740     1965    5120    2100    5600    2300    6000    2400
8200     4000    9000    4700    10000   5200
HANDVEL  1970
3230     1500    3360    1535    3600    1510    4100    1600
4330     1800    4650    2900    5000    3000    7200    3900
10000    5000
HANDVEL  2090
2750     1501    2860    1575    3080    1700    3250    1900
3550     2015    3770    2270    4620    2600    5620    4600
7350     5735    8570    6350    10000   6700    13000   7020
16000    7210
HANDVEL  2210
2140     1575    2210    1610    2320    1500    2450    1530
2550     1825    2725    1900    2825    1960    2990    2270
3310     3010    3550    3100    5300    3912    7100    5900
7600     5900    8600    6300    10000   6700    13000   7020
16000    7210
HANDVEL  2330
1430     1500    1600    1515    1770    1600    1890    1620
1970     1780    2150    1845    2330    2010    2380    2170
2700     2274    3300    3380    3570    3495    4270    3915
6250     4550    7500    5500    10000   6250    13000   6690
16000    6960
HANDVEL  2450
1220     1470    1300    1540    1480    1620    1570    1640
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1710	1760	1850	1815	1940	1980	2015	2160
2360	2750	3250	2908	4000	3150	5300	4000
6200	4791	7550	5710	8200	6000	9000	6500
10000	6800	13000	7095	16000	7270		
HANDVEL	2570						
1140	1470	1200	1480	1260	1495	1460	1575
1625	1730	1760	1875	1840	2015	2180	2175
2360	2505	2530	2620	2660	2850	4250	3350
4700	3735	6000	4615	8200	6000	9000	6500
10000	6800	13000	7095	16000	7270		
HANDVEL	2690						
1150	1465	1210	1450	1310	1470	1360	1475
1440	1495	1540	1650	1590	1665	1715	1735
1750	1770	1950	1865	2080	2000	2130	2150
2260	2250	2470	2435	2800	3000	3750	3479
4900	3894	6300	4972	8420	6240	8730	6275
13000	6710	16000	6970				
HANDVEL	2810						
1190	1470	1230	1470	1320	1500	1475	1600
1770	1700	1900	1800	1960	1850	2140	1950
2260	2040	2420	2300	2980	3100	3470	3700
4420	4250	4660	4340	5330	5000	5730	5135
6750	5915	8000	6000	9000	6650	10000	6800
13000	7095	16000	7270				
HANDVEL	2930						
1215	1465	1270	1480	1340	1505	1405	1525
1550	1625	1780	1680	1860	1795	1950	1845
2085	1900	2270	1950	2800	2500	3360	2780
4660	3850	5030	4275	6000	5500	7000	6000
8000	6350	9000	6600	10000	6850	13000	7130
16000	7300						
HANDVEL	3050						
1270	1470	1305	1460	1410	1475	1510	1555
1590	1600	1780	1680	1840	1770	2060	1950
2160	1860	2300	1755	3480	3180	3670	3500
4050	3500	4800	3860	5630	4990	7000	6300
8000	6700	9000	6900	10000	7100	13000	7320
16000	7480						
HANDVEL	3170						
1305	1470	1400	1507	1430	1525	1535	1560
1575	1560	1635	1605	1710	1620	1750	1625
1845	1770	1960	1780	2010	1805	2060	1845
2200	1990	2245	2025	2310	2060	2390	2125
2650	2225	3000	2300	3700	2700	4650	3425
5750	4720	6070	5100	6460	5750	7730	6300
9000	6600	10000	6800	13000	7090	16000	7310
HANDVEL	3290						
1135	1480	1170	1483	1235	1545	1400	1555
1530	1620	1560	1625	1685	1725	1760	1750
1850	1875	2105	1920	2310	2250	2400	2290
2750	3130	3880	3775	4230	3970	4970	4380
5245	4635	6030	5015	7250	5500	8000	6000
9000	6250	10000	6500	13000	6880	16000	7150
HANDVEL	3410						
960	1480	1025	1484	1090	1490	1160	1510
1310	1640	1515	1755	1730	1925	2480	2570
3000	3500	4100	3800	5300	4000	6000	4200
8300	4800	7800	6000	10000	6500	13000	6880
16000	7150						
HANDVEL	3530						
960	1480	1005	1484	1070	1490	1140	1510
1250	1567	1290	1640	1430	1720	1495	1755
1570	1800	1640	1825	1710	1925	1800	2000
1960	2125	2460	2570	2860	2800	3200	3500
4400	4000	6100	4200	7300	5000	8000	6000
10000	6500	13000	6880	16000	7150		
HANDVEL	3650						
990	1470	1040	1470	1150	1510	1220	1550
1260	1560	1360	1605	1440	1625	1495	1730
1590	1820	1710	1860	1825	1925	2090	2340
2350	2525	2660	2750	2975	3230	3340	3570
4320	3910	6300	4899	7500	5400	10000	6300
13000	6730	16000	7060				
HANDVEL	3770						
1075	1475	1210	1425	1300	1490	1410	1555
1475	1600	1590	1865	1720	1810	1800	1865
1860	1890	1975	1950	2080	1970	2130	1990
2260	2300	2350	2430	2460	2530	2750	2800
2940	2890	2940	2920	3090	2980	3180	3025

3535	3050	3860	3150	4310	3875	6170	5400
8000	5900	10000	6350	13000	6770	16000	7070
HANDVEL	3890						
1120	1480	1170	1480	1240	1505	1315	1540
1460	1575	1515	1625	1680	1690	1790	1855
1820	1865	1980	2070	2110	2175	2320	2350
2410	2450	2585	2500	2710	2665	2860	2810
2940	2860	3120	2860	3260	3050	3400	3220
3650	3275	4090	3375	4480	3550	5150	3800
5590	4000	6350	4325	7150	4870	8450	5513
10000	6200	13000	6660	16000	6990		
HANDVEL	4010						
1280	1465	1330	1760	1400	1550	1525	1555
1605	1645	1750	1700	1870	1700	1945	1725
2080	1835	2215	2020	2290	2070	2550	2410
2770	2530	2860	2555	2950	2575	3240	3150
3650	3600	4850	3950	6100	4280	6640	4400
7500	5000	8600	5713	10000	6500	13000	6880
16000	7150						
HANDVEL	4130						
1235	1472	1285	1472	1425	1500	1470	1500
1505	1515	1605	1555	1720	1615	1820	1625
1980	1830	2120	1980	2220	2050	2280	2150
2390	2250	2520	2425	2630	2560	2740	2680
2910	3500	3190	3000	3540	3400	3820	3610
4630	3970	5950	4200	7150	4620	8000	4950
10000	5800	13000	6380	16000	6780		
HANDVEL	4250						
1050	1478	1085	1475	1110	1472	1190	1480
1240	1480	1325	1505	1460	1565	1560	1640
1690	1680	1790	1775	1820	1780	1910	1875
2045	1970	2125	2020	2390	2520	2660	2905
2840	3200	3015	3340	3580	3660	5500	4921
7450	5694	10000	6400	13000	6800	16000	7100
HANDVEL	4370						
840	1468	860	1472	945	1490	985	1480
1130	1515	1230	1555	1345	1615	1580	1738
1640	1755	1705	1780	2040	1980	2280	2310
2460	2355	2740	2575	2990	2875	3550	3175
3870	3420	4750	3800	5660	4050	6500	4500
8000	4950	10000	5450	13000	6130	16000	6610
HANDVEL	4490						
760	1475	795	1475	880	1485	910	1475
955	1495	1020	1545	1075	1555	1235	1570
1375	1625	1435	1675	1520	1700	1850	2045
2180	2470	2420	2710	2860	3300	3205	3600
3730	4020	5150	4300	5620	4450	6060	4550
6500	4650	7500	5200	10000	5900	13000	6450
16000	6840						
HANDVEL	4610						
720	1475	750	1460	830	1500	865	1490
1010	1520	1065	1550	1140	1585	1260	1620
1360	1680	1420	1705	1640	1865	1800	2000
2230	2750	3060	3360	3210	3580	4080	4000
4700	4300	5250	4400	6150	4575	7150	5080
8000	5400	10000	5900	13000	6450	16000	6840
HANDVEL	4730						
650	1475	740	1495	900	1505	935	1520
1000	1535	1105	1580	1260	1665	1330	1740
1540	1920	1630	1995	1785	2150	1960	2305
2180	2600	3370	3500	4750	4250	5090	4350
5820	4500	6310	4575	7500	5000	10000	5800
13000	6380	16000	6780				
HANDVEL	4850						
605	1475	655	1490	680	1470	750	1500
820	1505	990	1640	1140	1940	1415	2075
1630	2400	1705	2455	2210	3075	2660	3475
4250	3650	6300	4100	7500	4740	10000	6000
13000	6520	16000	6890				
HANDVEL	4970						
580	1480	600	1470	680	1475	800	1650
1130	1975	1360	2130	2300	3033	3900	3470
6200	4100	7000	4700	8000	5400	10000	6000
13000	6520	16000	6890				
HANDVEL	5090						
610	1465	660	1465	780	1475	860	1545
985	1670	1170	2025	1315	2225	2020	2550
3060	3500	4450	3900	5900	4050	6650	4621
7650	5072	10000	6000	13000	6520	16000	6890

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HANDVEL 5210
620     1465    680     1450    770     1520    800     1520
840     1500    935     1550    1070    1705    1180    1800
1320    1980    1610    2475    1795    2700    2250    3010
2590    3100    3120    3150    3820    3750    5000    4400
5450    4500    6350    4650    8000    5350    10000   5850
13000   6410    16000   6810
HANDVEL 5330
600     1470    690     1470    800     1475    1060    1885
1120    1905    1300    2125    1550    2260    1700    2390
2200    2734    3200    3437    4450    4350    5600    4925
6250    5330    8000    6000    10000   6700    13000   7020
16000   7260
HANDVEL 5450
605     1465    640     1477    700     1477    840     1775
950     1820    1060    1873    1170    2190    1430    2350
1680    2525    1760    2575    2050    2810    2360    3125
3050    3830    3940    4500    4850    4950    6500    5370
8150    5600    10000   6350    13000   6770    16000   7070
HANDVEL 5570
630     1460    670     1530    705     1550    800     1655
860     1820    1100    2200    1190    2225    1225    2245
1300    2275    1650    2675    2620    3720    3350    4445
3800    4640    5100    5050    6000    5413    7500    5900
10000   6700    13000   7020    16000   7260
HANDVEL 5690
650     1485    750     1525    785     1900    1010    2150
1720    2925    3620    4725    4170    5000    5215    5250
6000    5450    7200    5600    8100    6075    10000   7000
16000   7420
HANDVEL 5810
650     1476    710     1460    770     1650    1100    2027
2400    3100    3770    4200    4250    4450    7200    5600
8100    6075    10000   7000    13000   7240    16000   7420
HANDVEL 5930
780     1475    820     1464    890     1545    950     1605
990     1590    1220    1920    1370    1970    1800    2100
2100    2250    2600    2700    3000    3350    6000    5000
8000    5600    10000   6000    13000   6600    16000   7000
HANDVEL 6050
780     1472    880     1492    915     1497    1020    1500
1100    1500    1220    1520    1300    1530    1390    1575
1540    1775    1620    1800    1860    2175    1940    2310
2770    2950    3550    3725    4250    3850    5100    4100
5650    6175    6500    6500    8000    5000    10000   5500
13000   6170    16000   6640
HANDVEL 6170
780     1475    820     1460    890     1460    1100    1489
1220    1510    1280    1550    1350    1575    1460    1680
1680    1770    1990    2050    2330    2750    2650    2850
3300    3000    4350    3650    5900    4250    7400    4650
10000   5400    13000   6100    16000   6590
HANDVEL 6290
780     1475    825     1460    860     1470    900     1495
1090    1510    1140    1528    1240    1553    1350    1585
1440    1615    1520    1675    1820    1985    2250    2450
2400    2850    2770    3500    3700    3500    4450    3850
5050    4190    6650    4450    8000    4950    10000   5400
13000   6100    16000   6590
HANDVEL 6410
790     1475    820     1455    880     1455    1010    1510
1100    1510    1130    1515    1280    1570    1390    1625
1440    1635    1550    2025    1810    2175    2190    2625
3750    3400    4550    3760    5550    3950    6500    4100
7500    4650    10000   5400    13000   6100    16000   6590
HANDVEL 6530
780     1465    840     1450    870     1450    950     1505
990     1485    1090    1500    1130    1515    1180    1525
1240    1530    1310    1620    1500    1665    1650    1865
1750    1870    1900    2575    3100    3420    3850    3750
5450    4324    6350    4655    10000   5600    13000   6240
16000   6680
HANDVEL 6650
790     1480    840     1475    900     1470    1180    1520
1290    1550    1320    1565    1440    1625    1560    1625
1720    1725    1820    1765    2040    1880    2125    2000
2450    2375    2525    2650    2750    3300    3260    3700
3750    3875    4350    4150    4770    4375    6020    4720
7000    4900    10000   5600    13000   6240    16000   6680
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HANDVEL 6770							
780	1470	810	1450	845	1450	890	1440
1010	1505	1095	1505	1170	1515	1270	1540
1370	1575	1500	1600	1590	1700	1705	1720
1790	1780	1935	1940	1975	1965	2085	2075
2135	2120	2220	2250	2420	2390	2710	2825
2910	3070	3785	3890	4160	4160	5010	4600
5850	4775	6900	5000	10000	5750	13000	6340
16000	6760						
HANDVEL 6890							
780	1475	840	1490	875	1495	940	1498
1105	1502	1160	1527	1195	1550	1250	1569
1280	1569	1395	1593	1445	1602	1500	1625
1560	1650	1615	1668	1776	1810	1850	1950
2040	2425	2130	2385	2300	2515	2410	2590
2850	2800	3350	3400	4550	4030	6000	4500
8000	5300	10000	5700	13000	6310	16000	6730
HANDVEL 7018							
760	1465	810	1450	860	1450	915	1460
1010	1500	1115	1510	1225	1515	1300	1520
1390	1550	1450	1665	1560	1775	1630	1825
1940	2260	2160	2450	2260	2590	2850	3100
3380	3610	4350	4290	6050	4850	6380	5025
10000	5800	13000	6380	16000	6780		
HANDVEL 7130							
750	1472	800	1460	835	1455	890	1465
960	1475	1000	1505	1055	1555	1130	1557
1215	1560	1305	1573	1400	1655	1480	1755
1570	1850	1710	2000	1910	2275	2380	2850
3060	4050	4050	4650	5350	5380	6630	5500
10000	6000	13000	6520	16000	6890		
HANDVEL 7250							
735	1470	760	1470	800	1460	950	1495
1000	1500	1120	1510	1210	1510	1340	1535
1400	1590	1600	1720	1690	1875	2010	2150
2420	2600	2740	3275	3750	3950	4300	4250
5850	4825	7300	5150	10000	5700	13000	6310
16000	6730						
HANDVEL 7370							
715	1465	790	1470	830	1490	860	1495
900	1480	940	1480	990	1510	1040	1520
1120	1570	1160	1570	1200	1570	1300	1600
1350	1620	1510	1620	1670	1670	1870	1840
1960	1875	2110	2020	2325	2810	2495	3350
3060	3733	4340	4300	6150	4875	10000	5700
13000	6310	16000	6730				
HANDVEL 7490							
700	1460	785	1485	820	1490	910	1505
990	1510	1050	1555	1150	1572	1220	1580
1350	1615	1525	1630	1610	1650	1755	1705
1885	1745	1960	1810	2090	1950	2220	2055
2340	2330	2410	2600	2530	2725	2645	2910
2850	3550	3040	3825	3250	3985	3750	4350
4080	4500	5180	4760	6750	5025	10000	5700
13000	6310	16000	6730				
HANDVEL 7610							
680	1468	780	1450	950	1530	1140	1555
1250	1580	1380	1625	1620	1710	1700	1700
1830	1730	1990	1820	2170	2010	2270	2115
2440	2410	2680	2410	2740	3000	3050	3600
3350	3825	3930	4300	4940	4700	6000	4875
10000	6100	13000	6590	16000	6940		
HANDVEL 7730							
660	1465	870	1490	940	1495	985	1520
1260	1640	1400	1675	1750	1780	2000	1880
2150	2100	2450	2750	2800	2975	3450	3500
4100	4050	5000	4500	5450	4647	5900	4732
7200	5400	10000	6000	13000	6520	16000	6890
HANDVEL 7850							
620	1465	700	1400	830	1490	900	1495
945	1520	1025	1520	1120	1560	1185	1580
1255	1590	1380	1650	1450	1675	1570	1710
1620	1727	1805	1780	1950	1860	2120	1925
2200	2025	2300	2430	2900	3175	3130	3440
3350	3850	4160	4250	4870	4550	6450	5182
7200	5500	10000	6200	13000	6660	16000	6990
HANDVEL 7970							
600	1475	630	1455	720	1460	900	1520
1060	1545	1120	1550	1200	1580	1250	1640

1430	1675	1610	1740	1720	1745	1830	1790
1950	1850	2050	2025	2120	2125	2220	2450
3350	3250	3800	3500	5800	4500	6650	4732
8000	5250	10000	5800	13000	6380	16000	6780
HANDVEL	8090						
555	1466	610	1450	700	1465	800	1505
880	1510	1000	1550	1080	1570	1170	1575
1400	1655	1570	1780	1800	1804	1900	1915
2100	2825	2550	3200	4100	3500	5200	4120
6250	4600	8000	5500	10000	6200	13000	6660
16000	6990						
HANDVEL	8210						
525	1475	580	1452	680	1480	860	1520
970	1550	1030	1550	1120	1580	1210	1635
1410	1680	1460	1713	1515	1770	1620	1810
1850	1845	1950	1855	2010	2120	2110	2375
2150	2500	2250	2500	2320	2550	2380	2575
2650	2890	3000	3350	4000	3720	6100	4661
7000	5200	10000	6200	13000	6660	16000	6990
HANDVEL	8330						
490	1475	540	1460	600	1460	725	1500
930	1610	1150	1645	1305	1690	1390	1705
1610	1800	1705	1875	1760	1885	1860	2000
1980	2540	2500	3425	2700	3710	4000	3900
4750	4270	5050	4420	5900	4800	8000	5150
10000	5600	13000	6240	16000	6680		
HANDVEL	8450						
440	1475	500	1455	530	1500	590	1528
620	1532	755	1545	850	1550	920	1575
1170	1660	1280	1685	1400	1811	1535	1835
1570	1950	1630	2080	2340	2650	2620	2750
3350	3250	4120	3940	5300	4500	7750	5000
8000	5050	9000	5175	10000	5300	13000	6030
16000	6540						
HANDVEL	8570						
390	1475	490	1480	650	1485	720	1560
750	1550	840	1550	900	1550	980	1585
1080	1660	1170	1675	1305	1725	1480	1780
1670	1825	1750	1885	1825	2025	1960	2125
2070	2350	2150	2675	2350	2750	2600	2800
3350	3730	3620	4300	5220	4815	6750	4760
8000	4940	9000	5100	10000	5250	13000	6000
16000	6510						
HANDVEL	8690						
345	1480	400	1480	500	1520	860	1590
1000	1615	1150	1670	1290	1640	1330	1800
1410	1835	1510	1850	1770	1950	1885	1990
2190	2240	2300	2310	2450	3000	2650	3300
3300	4000	5450	4300	6150	4500	7000	4800
8000	5000	10000	5400	13000	6100	16000	6590
HANDVEL	8810						
305	1480	500	1495	560	1525	680	1530
720	1555	900	1605	1070	1660	1130	1740
1260	1780	1400	1815	1510	1870	1610	1920
1750	1960	2040	2175	2250	2350	2420	2700
2650	3170	2750	3730	3600	5400	5100	6025
6050	6256	8000	6500	9000	6650	10000	6800
13000	6900	16000	7000				
HANDVEL	8930						
265	1460	440	1460	500	1480	705	1590
935	1640	1080	1755	1350	1855	1450	1900
1595	1943	1695	1980	1900	2065	2145	2280
2555	2625	2790	2775	3050	3375	3325	3975
3615	4120	4180	4400	5350	4760	7000	5075
8000	5250	9000	5380	10000	5500	13000	6170
16000	6640						
HANDVEL	9050						
260	1460	300	1460	400	1570	735	1650
930	1670	1040	1700	1300	1825	1415	1900
1650	1975	1740	2055	1915	2155	2120	2375
2210	2525	2330	2610	2460	2750	2650	2850
2750	2975	2875	3000	3200	3150	3300	3225
4050	3800	4370	4100	5250	4650	6000	4825
8000	5150	9000	5350	10000	5550	13000	6200
16000	6660						
HANDVEL	9170						
225	1465	400	1540	760	1595	960	1685
1260	1920	1590	2045	1740	2100	1960	2265
2250	2440	2525	2700	2840	3653	3310	3950

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4130    4300    5750    4800    6350    4925    8000    5300
10000   5700    13000   6310    16000   6730
HANDVEL 9290
200     1465    260     1520    500     1660    870     1825
900     1900    1080    2100    1520    2400    1900    2200
2100    2600    2320    2600    2600    2800    4300    3000
4900    3500    6840    5550    8000    5800    10000   6200
13000   6660    16000   6990
HANDVEL 9340
200     1465    250     1480    300     1600    460     1650
600     1700    770     1750    900     1900    1020    1950
1950    2200    2160    2500    2420    2600    2650    2800
3700    2900    4400    3000    4950    3500    6050    4925
8000    5385    10000   5790    13000   6370    16000   6780
HANDVEL 9420
170     1465    230     1500    270     1650    380     1700
515     1950    570     1950    750     1950    1000    2700
2280    2650    2550    2650    3000    2800    3700    3500
4400    4000    5050    4250    6050    4925    8000    5385
10000   5790    13000   6370    16000   6780
HANDVEL 9480
170     1465    230     1500    280     1600    350     1650
500     2000    650     2300    900     2400    1300    2550
2700    2700    3100    2900    4600    4200    6050    4925
8000    5385    10000   5790    13000   6370    16000   6780
HANDVEL 9554
170     1465    230     1500    280     1600    350     1650
500     2000    650     2300    900     2400    1300    2550
2700    2700    3100    2900    4600    4200    6050    4925
8000    5385    10000   5790    13000   6370    16000   6780
*END
```

```
*JOB     SM      LINE3    KDM      MADEFIN
*CALL    DUMIN
*CALL    DEFINE  CDP              INV      MADEFIN TVRMS    LINE3
HANDVEL 410
5200     1400    5700     1400     6000     1500    8000    2300
9000     3500    10000    4000
HANDVEL 650
5200     1400    6000     1400     6300     1620    6400    1680
7200     2100    8000     2500     9000     3450
HANDVEL 890
5200     1400    6000     1400     6600     1600    6700    1700
6900     1780    7400     2050     7800     2200    8500    2750
9000     3200    10000    3600
HANDVEL 1370
5150     1400    5600     1400     5800     1500    6000    1500
6300     1650    6700     1850     6800     2000    7200    2300
8000     2850    9000     3500     10000    4000
HANDVEL 1490
4900     1400    5400     1400     6000     1700    6600    1800
8000     2000    10000    2600
HANDVEL 1850
3600     1400    4000     1400     4500     1500    4800    1750
5200     1850    6000     2000     6500     2200    7000    2650
9000     3300    10000    3500
HANDVEL 1970
3200     1400    4100     1450     4500     1750    4700    2100
6000     2400    10000    3500
HANDVEL 2090
2700     1400    3000     1500     3100     1600    3600    1750
4000     1900    5000     2400     7000     2900    10000   3600
HANDVEL 2210
2000     1400    2500     1400     2750     1620    3200    2000
3700     2500    5000     2600     7000     3000    10000   3800
HANDVEL 2330
1300     1400    1700     1400     2800     1700    4200    2500
7000     3400    10000    3900
HANDVEL 2570
1100     1400    1300     1400     1700     1500    2250    1900
2800     2500    3900     2900     5000     3100    7000    3600
10000    3900
HANDVEL 2810
1000     1400    1800     1400     2200     1600    2300    1900
3000     2200    3300     2200     4500     2900    6000    3300
8000     3800    10000    4200
HANDVEL 3170
1200     1400    1500     1400     2000     1600    2500    2000
3000     2050    3800     2250     5000     2750    7000    3400
10000    3900
HANDVEL 3530
900      1400    1200     1400     1900     1750    2900    2350
4000     2650    6000     3100     7000     3400    10000   3900
HANDVEL 3650
900      1400    1300     1400     1900     1775    3000    2400
4000     3200    5000     3600     7000     4000    10000   4300
HANDVEL 3890
1000     1400    1400     1400     2100     1650    3100    2150
4500     2750    7000     3400     10000    3900
HANDVEL 4010
1280     1400    2000     1450     2370     1650    2550    2050
3800     2250    5000     3200     6500     3700    10000   4600
HANDVEL 4250
1000     1400    1400     1400     1900     1600    2100    1350
3000     2100    4000     2450     4700     3000    6000    3500
10000    4000
HANDVEL 4610
720      1400    1000     1450     1400     1550    1800    1600
2250     1900    2900     2350     4000     3100    6000    3600
10000    4500
HANDVEL 4850
605      1400    800      1450     1000     1520    1200    1650
1700     2000    3100     2650     6000     3500    10000   4600
HANDVEL 4970
380      1400    800      1450     1200     1700    1800    2200
2800     2450    4000     2850     6000     3400    8000    4500
10000    5000
HANDVEL 5090
510      1400    800      1400     1300     1350    2000    2000
3500     2650    4000     3200     6000     3500    8000    4200
10000    4600
```

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HANDVEL 5210
620     1400    800     1400    1000    1500    1300    1700
1300    2000    2600    2300    4000    3000    6000    3300
8000    3900    10000   4300
HANDVEL 5450
605     1400    700     1400    1000    1550    1200    1750
1800    1800    2400    2200    3000    2800    4500    3000
6000    3500    8000    3900    10000   4300
HANDVEL 5570
630     1400    700     1450    1000    1600    1200    1900
1800    2000    2500    2400    3000    2200    4000    3000
6000    3800    8000    4300    10000   4600
HANDVEL 5810
650     1400    800     1500    1250    1800    2340    2250
2600    2100    3000    1900    4000    2300    5000    3400
6000    3600    8000    4100    10000   4400
HANDVEL 6050
780     1400    1300    1400    1500    1600    2400    2200
3000    2600    4000    3000    6000    3500    8000    3800
10000   4100
HANDVEL 6290
700     1400    1000    1400    1400    1450    1600    1600
2000    1800    2300    2300    2600    2950    5000    3000
7000    3300    10000   3600
HANDVEL 6530
700     1400    1000    1400    1300    1450    1500    1600
1800    1750    2000    2050    2500    2400    3100    2650
3600    2750    5000    3200    7000    3500    10000   3900
HANDVEL 6770
700     1400    1200    1450    1500    1525    1800    1600
2000    1800    2750    2300    3700    2850    5000    3200
7000    3500    10000   3700
HANDVEL 7370
700     1400    1000    1400    1200    1450    1400    1550
1700    1600    2200    1950    2250    2200    4000    2800
5000    3150    7000    3500    10000   4000
HANDVEL 7610
600     1400    1000    1400    1300    1500    2000    1650
2300    1800    2600    2200    2800    2550    3400    2850
6000    3150    10000   3600
HANDVEL 8090
500     1400    900     1400    1100    1500    1400    1500
1500    1600    2000    1800    2100    2200    3000    2750
3500    2500    4500    3000    7000    3500    10000   3900
HANDVEL 8210
500     1400    800     1450    1000    1500    1200    1500
1500    1600    2000    1800    2400    2350    2900    2700
4500    3300    5500    3300    7000    3400    10000   3600
HANDVEL 8450
300     1400    900     1500    1400    1600    1600    1600
1660    1825    2000    2100    2200    2250    3000    2600
3500    2500    5000    3000    7000    3500    10000   3900
HANDVEL 8690
300     1400    500     1400    600     1475    700     1500
900     1525    1100    1550    1400    1650    2000    1800
2600    2350    2700    2800    3000    3350    5000    3850
7000    4100    10000   4300
HANDVEL 8810
200     1400    500     1450    550     1500    700     1500
800     1550    1200    1650    1900    1925    2500    2450
3000    3350    4000    3800    5500    4100    10000   4500
HANDVEL 9050
200     1400    300     1450    400     1520    700     1550
1200    1600    2000    1900    2700    2400    3400    2800
5000    3200    7000    3400    10000   3700
HANDVEL 9400
100     1400    200     1400    300     1550    1000    2000
1800    2400    3600    2400    5000    2800    7000    3300
10000   3700
*END
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*JOB     SM       LINE3    KDM      MIGRDEFA
*CALL    DUMIN
*CALL    DEFINE   CDP               INV      MIGRDEFATVRMS    LINE3
HANDVEL  410
100      1460     5205     1465     5750     1500     6320     1920
7000     2300     7820     3000     9000     4200     10000    4500
HANDVEL  890
100      1460     5260     1480     6000     1530     6500     1675
7100     2100     7800     3200     9000     4250     10000    4400
HANDVEL  1480
100      1460     5200     1480     6000     1625     6500     1800
6900     2000     8000     3000     10000    4200
HANDVEL  1660
100      1460     4500     1480     5000     1500     5500     1600
6000     1900     6500     2100     7000     2400     8000     3000
10000    4300
HANDVEL  2010
100      1460     3000     1475     3500     1480     4000     1520
4500     1800     5000     2300     6000     2750     8000     3700
10000    4500
HANDVEL  2210
100      1460     2140     1470     2210     1500     2550     1700
2825     1830     3550     3100     5300     3755     8000     4050
10000    4500
HANDVEL  2450
100      1460     1220     1470     1300     1540     1570     1640
1710     1760     3250     2500     4000     2985     6200     3665
8200     4680     10000    5200
HANDVEL  3530
940      1480     1070     1490     1495     1755     1960     1975
2860     2550     6100     3780     8000     4590     10000    4975
HANDVEL  4200
1235     1470     1285     1470     1425     1500     1505     1515
1820     1625     2520     2375     3190     2700     4630     3400
5950     3990     8000     4700     10000    5500
HANDVEL  4800
720      1465     750      1460     1010     1580     1260     1680
1800     1920     3210     3370     4080     3840     5250     4135
6150     4255     8000     4860     10000    5310
HANDVEL  5000
580      1465     680      1475     1130     1920     2300     2730
3900     3120     6200     3800     7000     4230     10000    5400
HANDVEL  5150
620      1465     680      1465     800      1520     1320     1980
2250     2730     3820     3375     5450     4050     8000     5030
10000    5265
HANDVEL  5800
650      1465     710      1470     1100     1820     2400     2790
3770     3780     4250     4000     6000     4500     10000    5950
HANDVEL  6100
780      1465     890      1460     1220     1510     1350     1575
1990     2050     2650     2850     4350     3650     5900     4250
7400     4650     10000    5400
HANDVEL  6410
790      1465     880      1465     1280     1570     1810     2175
2190     2625     3750     3400     5550     3950     6500     4100
7500     4650     10000    5400
HANDVEL  6770
780      1460     1010     1535     1170     1575     1270     1620
1370     1625     1500     1680     1590     1785     1705     1805
1790     1870     1935     2035     1975     2065     2085     2180
2135     2225     2220     2360     2420     2485     2710     2880
2910     3070     4000     3600     5010     4140     5850     4300
6900     4500     10000    5175
HANDVEL  7050
750      1460     800      1460     835      1460     890      1495
960      1535     1000     1580     1055     1635     1130     1700
1215     1720     1305     1750     1400     1860     1480     1975
1570     2080     1710     2230     2000     2325     6600     4100
10000    5175
HANDVEL  7250
750      1460     800      1460     835      1460     890      1495
960      1535     1000     1580     1055     1635     1130     1700
1215     1720     1305     1750     1400     1860     1480     1975
1570     2080     1710     2230     2000     2325     6600     4100
10000    5175
HANDVEL  7490
700      1460     785      1485     820      1490     910      1505
990      1510     1050     1555     1150     1572     1220     1580
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1350    1645    1525    1680    1610    1715    1755    1790
1885    1830    1960    1900    2090    2050    2220    2150
2340    2420    2410    2650    2530    2725    2645    2810
6750    4100    10000   5130
HANDVEL 9200
240     1460    300     1460    350     1460    735     1650
930     1670    1040    1700    1300    1825    1415    1900
1650    1975    1740    2055    1915    2155    2120    2375
2210    2525    2330    2610    2460    2750    2650    2850
2750    2975    2875    3000    3200    3090    3300    3130
4050    3320    4370    3580    5250    4010    6000    4120
8000    4410    9000    4580    10000   4850
HANDVEL 9554
180     1465    300     1600    515     1950    610     2040
1300    2300    3100    2900    4600    3600    6100    4320
8000    4770    10000   5130
*END
```

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